

Low Emission (Clean Air) Zones



Low Emission Zones – also known as Clean Air Zones – aim to achieve compliance with legal air quality objectives by discouraging the use of highly polluting vehicles in urban areas. This briefing note examines current knowledge as to whether these initiatives work, gaps in our understanding and lessons for future place-based air quality solutions.

Background

Air pollution represents the largest environmental risk to health in the UK, responsible for between 28,000 – 36,000 premature deaths each year.¹ Research has linked poor air quality with a wide range of adverse health outcomes including the development of childhood asthma², heart and lung disease³ and cancer⁴; poor mental health⁵ and cognitive performance⁶ and the onset of neurodegenerative diseases (e.g., Alzheimer's)⁷; and poor birth outcomes.⁸ This places significant financial burden on the NHS and national economy; in 2017 the total NHS and social care cost due to air pollution exposure is estimated to be up to £157 million⁹, and the wider economic costs to society are estimated to be £20 billion per year.¹⁰ The health effects of air pollution are disproportionately borne by those of lower socio-economic status and minority ethnic groups, who are exposed to higher levels of air pollution^{11,12}, and are more likely to experience

Overview

- Clean Air Zones and Low Emission Zones aim to discourage the use of the most polluting vehicles, typically in urban areas.
- They are being increasingly introduced by local authorities to achieve compliance with legally binding air quality objectives.
- Many questions remain regarding their effectiveness to improve air quality, health, and impacts on wider society.
- Scientific evidence can be used to inform future place-based air quality solutions.

pre-existing health conditions that make them more susceptible to health impacts from exposure.¹³

Over the last 40 years, concentrations of priority air pollutants such as nitrogen dioxide (NO₂) and fine particulate matter (PM_{2.5}) have declined substantially.¹⁴ However, the UK still currently fails to meet statutory air quality objectives for NO₂ in many urban areas¹⁵, and mean PM_{2.5} concentrations across much of the UK exceed World Health Organisation Global Air Quality Guidelines.¹⁶ Transport remains an important source of air pollution, accounting for 34% of nitrogen oxide (NO_x) emissions and 13% of PM_{2.5} emissions in 2018.¹⁷ In urban environments, road traffic is often the dominant source of NO_x emissions^{18,19}, and is consequently a target for policy interventions.²⁰ Such interventions include the introduction of 'Low Emission' or 'Clean Air Zones', mandated in multiple UK cities as the most effective way to achieve legislative compliance and improve air quality.

What is a Clean Air Zone?

A Clean Air Zone (CAZ) defines an area where targeted action is taken to improve air quality. According to the Clean Air Zone Framework, published in 2020 by the Department for Environment, Food & Rural Affairs (Defra) and the Department for Transport (DfT), a CAZ should bring together local measures to deliver immediate action to improve air quality and health, support local growth and ambition, and a transition to a low emission economy.²¹

There are two types of CAZ:

- **Charging CAZ** – where users of the most polluting vehicles are discouraged from entering the zone via imposing fees.
- **Non-charging CAZ** – which do not include the use of charge-based access restrictions, and rely on other measures to improve air quality.

In a charging CAZ, vehicles that do not meet minimum emissions standards (based upon its EURO standard) are required to pay a fee to enter or operate within the CAZ. For example, a diesel car must meet Euro 6 standards, and a petrol car must meet Euro 4 standards. There are four increasingly stringent classes of charging CAZ (class A to D) controlling which types of vehicles are required to meet the standards (see table below). A charging CAZ can also be implemented alongside non-charging measures. Low Emission Zones (LEZs), Ultra Low Emission Zones (ULEZs) and Zero Emission Zones (ZEZs) can all also be classed as a type of charging CAZ, but may differ in emission standards set.

Class	Vehicle type
A	Buses, coaches, taxis, private hire vehicles
B	Buses, coaches, taxis, private hire vehicles, heavy goods vehicles (HGVs)
C	Buses, coaches, taxis, private hire vehicles, HGVs, vans, minibuses
D	Buses, coaches, taxis, private hire vehicles, HGVs, vans, minibuses, cars, (the local authority has the option to include motorcycles)

“Clean Air Zones improve the urban environment to support public health and the local economy, making cities more attractive places to live, work, do business and spend leisure time. They support cities to grow and transition to a low emission economy thus ensuring these benefits are sustainable for the long term.”

– Government's vision for Clean Air Zones

A non-charging CAZ can include broader transport measures such as optimising traffic management, accelerating ultra-low emission vehicle take up, and encouraging healthy and active travel. The CAZ framework also lays out broader non-transport strategies for air quality management including measures to minimise stove and wood burner emissions, or encourage the use of low NOx boilers.²¹

CAZs were first announced in the UK Government's 2015 national plan to improve air quality, with five cities (Birmingham, Leeds, Nottingham, Southampton and Derby) mandated to plan and implement a CAZ by 2020.²² This plan was later withdrawn and replaced by the 2017 UK Plan for tackling roadside nitrogen dioxide concentrations²³, where the government identified CAZs as the “fastest and most cost-effective way of meeting NO₂ limit values on the majority of urban roads”. 36 local authorities were further directed to produce local plans to reduce NO₂ levels in the shortest time possible, and are required to benchmark proposals against the possible introduction of a charging CAZ. It should be noted that if a local authority can identify alternative measures that were at least as effective at reducing NO₂, those measures should be preferred. The Government provided extensive guidance for local authorities through the 2017 CAZ Framework (later updated in 2020²¹). However, the implementation of CAZs and selection of alternative measures has been inconsistent and faced multiple challenges from local resistance to a national pandemic.

Where are the Clean Air Zones?

To date (June 2022) charging CAZs have been implemented in the cities of Bath, Birmingham and Portsmouth. A bus-only CAZ has also been introduced in York city centre. A number of cities are operating various emission control zones (types of charging CAZ) such as the Greater London LEZ, the Central London ULEZ and most recently, the UK's first ZEZ launched in Oxford, February 2022.

Currently, there are plans to implement CAZs in many other cities including Bradford (autumn 2022), Newcastle (summer 2022), Bristol (late 2022) and Sheffield (late 2022). The Scottish Government has also committed to introducing LEZs in Scotland's four biggest cities (Aberdeen, Dundee, Edinburgh and Glasgow) in 2022, with enforcement beginning in 2023/24.²⁴ Some cities had previously planned CAZs but no longer require them due to air quality improvements (e.g., Leeds, Leicester and Nottingham).

Several local authorities have opted for alternative measures in preference to CAZ proposals. Cardiff Council proposed a package of measures including a bus retrofitting programme, taxi mitigation measures and an active travel package making it easier for people to walk and cycle in the city centre, which was accepted in place of a CAZ.²⁵ Greater Manchester Combined Authority has abandoned the original CAZ plan due to go live in 2022 after concerns about financial hardship and compliant vehicle availability, and are now working to deliver a new clean air plan.²⁶

What is the impact of Covid-19?

Many CAZ plans due to start in 2020 were postponed due to Covid-19. During national lockdown, much of the UK observed initial air quality improvements, as a result of reductions in traffic and industrial activities.^{27,28} Some local authorities considered these temporary improvements as grounds to delay, or even cancel previous CAZ plans, on the grounds they were no longer necessary. However research

has shown these benefits were typically short-lived, and actual emissions changes were lower than originally reported after accounting for the effects of weather and longer term trends.^{29,30} By summer 2022 traffic volume and air pollution returned to, or even exceeded pre-pandemic levels in many cities.³¹ Research has also found complex changes in travel behaviour post-pandemic³² that will also need to be considered to ensure urban air quality measures are being implemented in the most effective manner.

Do Clean Air Zones improve air quality?

The primary aim of CAZs is to achieve compliance with legislative limit values for NO₂ in the shortest possible timescale. Limited available evidence does suggest area-based traffic management strategies (like CAZs and LEZs) can improve urban air quality³³, however generally, evidence on their efficacy is mixed. Over 200 LEZs are operating across Europe, however evidence on their effectiveness for air quality and health are largely inconsistent.³⁴ Early evidence from the London LEZ found it did not reduce NO₂ and only slightly reduced PM_{2.5} (<3%) levels³⁵ likely due to overall traffic increasing during the study period. Later evidence identified reduced NO₂ and NO_x concentrations, but no improvements for PM₁₀³⁶ and more recent evidence from the London ULEZ found roadside NO₂ concentrations reduced by 44%.³⁷ Analysis commissioned by the Clean Air Fund optimistically suggests CAZs could deliver an average 18% (or 5 µg/m³) reduction in NO₂, preventing at least 1% of local deaths and injecting millions of pounds in the cities where they are introduced.³⁸ Early indications from the Birmingham CAZ, provided in a recent 6-month interim report, show average NO₂ levels have reduced by 13%.³⁹ However, due to the relatively small proportion of the city population residing in the CAZ area (~55,000) and no evidence of impact upon PM concentrations, overall health benefits at a city level are marginal.

Unintended consequences of CAZs

CAZs present a broader opportunity for local authorities to improve air quality and public health, however, may also impact local communities and businesses through unintended consequences associated with restrictive management.

Those from poor and disadvantaged communities are more likely to own older, used cars⁴⁰ that are less likely to meet the stricter emission standards of a CAZ or LEZ. Therefore, these communities may be disproportionately impacted by the introduction of charging schemes. Before the implementation of London's LEZ, a prospective health impact assessment identified several important potential consequences.⁴¹ Community access to services provided via transportation, such as minibuses used by community groups, including ethnic, voluntary, youth and disabled groups, or community services such as Meals on Wheels, and St. Johns Ambulance, could be negatively impacted due to increased costs.⁴¹ Small businesses that rely on vehicles affected by the LEZ may also be negatively impacted, with potential knock-on effects for employment.⁴¹

Case study: Bradford CAZ

Bradford is one example of a local authority that faced direction from the government to introduce a CAZ, that is currently set to be implemented in early 2022. Bradford is a large multi-ethnic city that faces high levels of socio-economic deprivation, with 40% of residents living in areas that rank among the most deprived in England.⁴² In a recent qualitative study, residents of Bradford felt the CAZ would financially disadvantage communities already living in socio-economic and environmental poverty.⁴² This research further highlighted the need to consult and engage with vulnerable and seldom-heard communities, to create a greater sense of ownership that could lead to wider acceptance.⁴²

The future of CAZs

CAZs could provide many public health benefits including air quality improvements, reduced carbon emissions, increased physical activity, enhanced neighbourhood appearance and community cohesion, especially when combined with other air quality measures.⁴³

However, many **key questions remain to be answered:**

- *What is a "successful" CAZ? Which metrics should we consider when determining their effectiveness?*
- *Is the CAZ a cost-effective place-based air quality measure? And how can the money raised by a charging CAZ be most effectively re-invested into transport related projects?*
- *Are CAZs an effective measure to achieve health gains among the most vulnerable individuals and disadvantaged communities?*
- *Which stakeholders need to be consulted and engaged to ensure effective and equitable development of these clean air measures?*
- *How can their purpose and benefits be best communicated to the general public?*
- *How could future place-based air quality solutions be redesigned to maximise public health benefits? And how would this differ from solutions designed to achieve compliance with NO₂ limits?*

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