

## Question:

### 1. *What is a Clean Air Zone and how is it implemented in the UK?*

**Source:** Clean Air Zones, Low Emission Zones and the London ULEZ.pdf

#### **Expected answer:**

- “Clean Air Zones (CAZs) are being introduced in cities across the UK to help reduce air pollution.”
- “These zones aim to improve air quality by deterring the most polluting vehicles from entering certain areas.”
- “Some CAZs charge vehicles that do not meet emissions standards a daily fee.”
- “Local authorities are responsible for setting up CAZs in their regions with the support of central government.”
- “The zones use Automatic Number Plate Recognition (ANPR) technology to monitor vehicles.”
- “Funds have been made available to help upgrade vehicles to compliant standards.”
- “There are four types of CAZ (Class A to D) that apply to different vehicle types.”
- “Vehicles that do not meet minimum emission standards for their class may have to pay a daily charge to drive within the zone.”
- “The UK government supports local authorities to identify, assess, and implement the most effective local measures to improve air quality.”

**Source:** clean-air-strategy-2019.pdf

#### **Expected answer:**

- “A Clean Air Zone (CAZ) is a defined geographic area where targeted action is taken to improve air quality. Local authorities are responsible for the implementation of CAZs and must carry out local assessments to determine whether a CAZ is required and what type of CAZ is most appropriate. The primary objective is to bring NO<sub>2</sub> concentrations within legal limits in the shortest possible time.”
- “CAZs can be either charging or non-charging zones: Charging Clean Air Zones require some drivers to pay a charge to enter the zone based on the type of vehicle they drive and its emissions. Non-charging Clean Air Zones are focused on improving air quality without requiring drivers to pay, for example through traffic flow measures or retrofitting buses.”
- “The Government provides support and guidance to local authorities, including a Clean Air Zone framework that sets out principles for consistency, fairness and transparency.”

## **GPT-3.5, text, TF-IDF + Cosine**

A Clean Air Zone (CAZ) is an area where targeted action is taken to improve air quality by reducing pollution levels, particularly from vehicles. In the UK, CAZs are implemented by local authorities to address air quality issues, especially related to nitrogen dioxide emissions. Measures within a CAZ may include charging high-polluting vehicles to enter the zone, promoting cleaner transportation options, and implementing traffic management strategies. The UK government provides funding and support to local authorities to establish and enforce CAZs, with the aim of reducing harmful emissions and improving air quality for residents.

[1] Guide to UK Air Pollution Information .pdf | Score: 0.202

[2] Air quality - GOV.UK.pdf | Score: 0.200

[3] air\_pollution\_uk\_2023\_issue\_1.pdf | Score: 0.183

## **GPT-3.5, text, BM25**

A Clean Air Zone (CAZ) is an area where measures are implemented to improve air quality by reducing air pollution from vehicles. In the UK, CAZs are established by local authorities to charge non-compliant vehicles for entering the designated area based on their emissions levels. The rules and standards for CAZs are typically based on Euro emission engine classifications, with non-compliant vehicles being charged for entry. Local authorities have the power to set daily charges, enforce compliance through Automatic Number Plate Recognition cameras, and

implement scrappage schemes to encourage the replacement of older, more polluting vehicles with cleaner alternatives.

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446

[2] Air quality targets - Detailed Evidence report.pdf | Score: 23.172

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 23.092

### **GPT-3.5, text, SBERT + FAISS**

A Clean Air Zone (CAZ) is a designated area where targeted action is taken to improve air quality by reducing pollution from vehicles. In the UK, CAZs are implemented by local authorities to address high levels of nitrogen dioxide (NO<sub>2</sub>) emissions. Measures in CAZs may include restrictions on high-polluting vehicles, promoting the use of low-emission vehicles, and implementing charges for vehicles that do not meet emission standards. The first CAZ was introduced in Bath in March 2021, followed by Birmingham, Bradford, Bristol, and Portsmouth. Additional CAZs are planned for implementation in various areas to reduce air pollution and improve public health.

[1] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.587

[2] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.571

[3] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.565

### **GPT-3.5, text, No-RAG**

A Clean Air Zone (CAZ) is an area where targeted action is taken to improve air quality and reduce pollution from vehicles. In the UK, CAZs are implemented by local authorities in areas where air quality does not meet legal standards set by the government.

There are different types of Clean Air Zones, including:

1. Non-charging CAZs: These zones focus on encouraging cleaner vehicles through measures such as improved public transport, cycling infrastructure, and incentives for low-emission vehicles.
2. Charging CAZs: In these zones, vehicles that do not meet certain emissions standards are charged a fee to enter the area. This is intended to discourage the use of high-polluting vehicles and incentivize the use of cleaner alternatives.

Local authorities have the power to implement Clean Air Zones in their areas, and they must follow guidelines set by the government on how to design and enforce these zones. The government provides funding and support to help local authorities implement CAZs effectively.

Overall, the goal of Clean Air Zones in the UK is to reduce air pollution, improve public health, and meet legal air quality standards.

### **GPT-3.5, text, Hybrid-RAG**

A Clean Air Zone (CAZ) is a designated area where targeted measures are implemented to enhance air quality and reduce pollution from vehicles. In the UK, local authorities establish CAZs in regions where air quality fails to meet government-set legal standards [1].

There are two main types of Clean Air Zones:

1. Non-charging CAZs: These zones prioritize promoting cleaner transportation options by enhancing public transport, cycling infrastructure, and offering incentives for low-emission vehicles [1].
2. Charging CAZs: In these zones, vehicles that do not meet specific emissions standards are subject to a fee upon entering the area. This fee aims to discourage the use of high-polluting vehicles and encourage the adoption of cleaner alternatives [1].

Local authorities hold the authority to implement Clean Air Zones in their jurisdictions, adhering to government guidelines on the design and enforcement of these zones. The government provides funding and assistance to support local authorities in effectively implementing CAZs [1].

The primary objective of Clean Air Zones in the UK is to mitigate air pollution, enhance public health, and ensure compliance with legal air quality standards [1]. By reducing harmful emissions from vehicles, CAZs contribute to creating a healthier environment for current and future generations [2].

In Wales, the government is committed to reducing exposure to air pollution and addressing the challenges posed by poor air quality, especially in light of the COVID-19 pandemic [6]. This underscores the importance of initiatives like Clean Air Zones in combating air pollution and safeguarding public health.

- [1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446
- [2] Air quality targets - Detailed Evidence report.pdf | Score: 23.172
- [3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 23.092
- [4] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.587
- [5] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.571
- [6] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.565

### **GPT-3.5, paragraph, TF-IDF + Cosine**

A Clean Air Zone (CAZ) is a designated area where targeted measures are implemented to improve air quality by reducing pollution levels, particularly from vehicles. In the UK, Clean Air Zones are established by local authorities to address air quality issues in specific areas. These zones typically involve restrictions or charges for vehicles that do not meet certain emissions standards when entering the designated area. Government funding is often provided to support local authorities in implementing and managing Clean Air Zones. The rollout of Clean Air Zones across different cities in the UK aims to reduce air pollution and improve public health by encouraging the use of cleaner vehicles and alternative modes of transportation.

- [1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 0.537
- [2] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.365
- [3] environmental-improvement-plan-2023.pdf | Score: 0.318

### **GPT-3.5, paragraph, BM25**

A Clean Air Zone is a designated area where targeted action is taken to improve air quality by reducing pollution levels. In the UK, Clean Air Zones are implemented by local authorities to discourage the most polluting vehicles from entering the area through measures such as charging schemes or restrictions on vehicle types. The goal is to reduce harmful emissions and protect public health by promoting cleaner transportation options and encouraging the use of low-emission vehicles within the designated zone.

- [1] Air quality\_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 32.238
- [2] Does low carbon energy transition impede air pollution Evidence from China's coal-to-gas policy.pdf | Score: 26.262
- [3] Does low carbon energy transition impede air pollution.pdf | Score: 26.262

### **GPT-3.5, paragraph, SBERT + FAISS**

A Clean Air Zone is a designated area where measures are put in place to reduce airborne pollution and improve air quality. In the UK, Clean Air Zones are implemented by local councils in areas identified as requiring such measures. These zones aim to deliver better health outcomes for the population by reducing pollution levels through various interventions and policies. The UK is divided into 43 zones for air quality assessment, with different zones categorized based on their characteristics such as agglomerations (large urban areas) and non-agglomerations (larger regions outside urban areas). Compliance with pollution limits in each zone is assessed using a combination of measured concentrations and modeling techniques.

- [1] environmental-improvement-plan-2023.pdf | Score: 0.764
- [2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.727
- [3] Air quality\_ policies, proposals and concerns.pdf | Score: 0.719

### **GPT-3.5, paragraph, No-RAG**

A Clean Air Zone (CAZ) is an area where targeted action is taken to improve air quality and reduce pollution from vehicles. In the UK, CAZs are implemented by local authorities in areas where air quality does not meet legal standards set by the government.

There are different types of Clean Air Zones, including:

1. Non-charging CAZs: These zones focus on encouraging cleaner vehicles through measures such as improved public transport, cycling infrastructure, and incentives for low-emission vehicles.
2. Charging CAZs: In these zones, vehicles that do not meet certain emissions standards are charged a fee to enter the area. This is intended to discourage the use of high-polluting vehicles and incentivize the use of cleaner alternatives.

Local authorities have the power to implement Clean Air Zones in their areas, and they must follow guidelines set by the government on how to design and enforce these zones. The government provides funding and support to help local authorities implement CAZs effectively.

Overall, the goal of Clean Air Zones in the UK is to reduce air pollution, improve public health, and meet legal air quality standards.

### **GPT-3.5, paragraph, Hybrid-RAG**

A Clean Air Zone (CAZ) is an area where targeted action is taken to improve air quality by discouraging the most polluting vehicles from entering the zone. In the UK, CAZs are implemented by local authorities in areas where air pollution levels exceed legal limits set by the government [1].

There are different types of Clean Air Zones, including:

1. Non-charging CAZs: These zones focus on encouraging cleaner vehicles to enter the area through incentives such as discounts on parking fees or access to priority lanes.
2. Charging CAZs: In these zones, vehicles that do not meet certain emissions standards are charged a fee to enter the area. The aim is to reduce the number of polluting vehicles on the roads and improve air quality.

Local authorities have the power to decide the boundaries of the Clean Air Zone, the types of vehicles that are affected, and the level of charges or incentives. The implementation of CAZs is part of the UK government's efforts to reduce air pollution and protect public health [1].

In the UK, air quality is a crucial aspect of a healthy environment, and efforts have been made to improve it significantly in recent decades [1]. The UK is divided into 43 zones for air quality assessment, with 28 being agglomerations zones (large urban areas) and 15 non-agglomeration zones (larger regions outside urban areas) [6]. The annual Air pollution in the UK report provides a summary of the UK's legal and policy framework for air quality, including compliance with pollution limits in each zone [6].

Furthermore, the Clean Air Strategy of 2019 outlines the importance of reducing airborne pollution through measures like Clean Air Zones to achieve improvements in the environment and better health for all [5].

Overall, the implementation of Clean Air Zones plays a crucial role in addressing air pollution issues and promoting a healthier environment for everyone.

[1] Air quality\_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 32.238

[2] Does low carbon energy transition impede air pollution Evidence from China's coal-to-gas policy.pdf | Score: 26.262

[3] Does low carbon energy transition impede air pollution.pdf | Score: 26.262

[4] environmental-improvement-plan-2023.pdf | Score: 0.764

[5] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.727

[6] Air quality policies, proposals and concerns.pdf | Score: 0.719

## DeepSeek, text, TF-IDF + Cosine

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to reduce air pollution, particularly from road transport, by discouraging the use of high-emission vehicles. These zones aim to improve air quality and public health by lowering concentrations of pollutants such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>).

### Implementation in the UK

Clean Air Zones are implemented through a combination of regulatory and financial measures, tailored to local air quality challenges. Key features include:

#### 1. Vehicle Restrictions

- CAZs classify vehicles based on their emissions standards (e.g., Euro 6 for diesel, Euro 4 for petrol).
- Non-compliant vehicles may face **charges** for entering the zone, or in some cases, be **banned entirely**.

#### 2. Types of CAZs

- **Class A**: Targets buses, coaches, taxis, and private hire vehicles.
- **Class B**: Includes the above plus heavy goods vehicles (HGVs).
- **Class C**: Extends to vans and minibuses.
- **Class D**: The strictest, covering cars, motorcycles, and all other vehicle types.

#### 3. Support Measures

- **Financial incentives**: Grants or subsidies to help businesses and individuals upgrade to cleaner vehicles.
- **Public transport improvements**: Enhanced bus services, cycling infrastructure, and walking routes to reduce reliance on private vehicles.

#### 4. Local Authority Leadership

- Local governments design and enforce CAZs based on Defra guidance, often following Air Quality Management Area (AQMA) declarations where legal pollution limits are exceeded.
- Examples include Birmingham's Class D CAZ and London's Ultra Low Emission Zone (ULEZ), which operates similarly but with stricter standards.

#### 5. Monitoring & Compliance

- Automatic Number Plate Recognition (ANPR) cameras enforce charges.
- Air quality monitoring stations track pollutant levels to assess effectiveness.

### Devolved Approaches

- **England**: Multiple cities (e.g., Bath, Sheffield) have implemented CAZs with varying restrictions.
- **Scotland**: Introduces **Low Emission Zones (LEZs)** in major cities (Glasgow, Edinburgh, Aberdeen, Dundee), banning non-compliant vehicles.
- **Wales**: Focuses on non-charging measures like traffic flow improvements and public transport investment.

### Legal Basis

CAZs align with the **UK Air Quality Standards Regulations (2010)** and the **Environment Act 2021**, which sets binding targets for PM<sub>2.5</sub> reduction.

By combining regulation, technology, and public engagement, Clean Air Zones aim to achieve sustained compliance with air quality standards while minimizing economic disruption.

[1] Guide to UK Air Pollution Information .pdf | Score: 0.202

[2] Air quality - GOV.UK.pdf | Score: 0.200

[3] air\_pollution\_uk\_2023\_issue\_1.pdf | Score: 0.183

## DeepSeek, text, BM25

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to improve air quality by reducing emissions from road transport, particularly nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM). These zones aim to discourage the use of highly polluting vehicles by imposing charges on non-compliant vehicles or restricting their access.

### **Implementation in the UK**

### 1. **Legal Basis**:

- The authority to establish CAZs in England and Wales stems from **Part III of the Transport Act 2000**, supplemented by the **Environment Act 1995** for air quality compliance.

- In Scotland, **Low Emission Zones (LEZs)** operate under the **Transport (Scotland) Act 2019**, while London's **Ultra Low Emission Zone (ULEZ)** and **Low Emission Zone (LEZ)** derive powers from the **Greater London Authority Act 1999**.

### 2. **Types of CAZs**:

CAZs are classified by the vehicle types they regulate:

- **Class A**: Buses, coaches, taxis, private hire vehicles.
- **Class B**: Adds vans and minibuses.
- **Class C**: Includes cars and motorcycles (e.g., Birmingham, Bristol).
- **Class D**: All vehicle types (e.g., London's ULEZ).

### 3. **Vehicle Standards**:

- Non-compliant vehicles (typically pre-**Euro 6** diesels or pre-**Euro 4** petrol) incur daily charges (e.g., £8–£100 depending on vehicle type).

- **Scotland's LEZs** enforce stricter bans, prohibiting non-compliant vehicles entirely (no payment option).

### 4. **Exemptions and Support**:

- National exemptions include **disabled tax-class vehicles, military vehicles, and historic vehicles**.

- Local authorities may offer **scrappage schemes** (e.g., grants up to £9,500 in London) to help replace non-compliant vehicles.

### 5. **Enforcement**:

- **Automatic Number Plate Recognition (ANPR)** cameras monitor compliance.
- Penalties for non-payment are capped (e.g., £120–£1,000, reduced if paid promptly).

### 6. **Challenges and Controversies**:

- CAZs face opposition over costs and perceived inequity, particularly during economic strain.
- Legal challenges (e.g., against London's ULEZ expansion) cite insufficient public transport alternatives.

### 7. **Air Quality Context**:

- CAZs target **NO<sub>2</sub>** and **PM<sub>2.5</sub>**, pollutants linked to respiratory and cardiovascular diseases.

- Compliance with **EU-derived legal limits** (retained post-Brexit) drives implementation, though some areas (e.g., Scotland) set stricter standards.

### **Outcomes**

Studies indicate CAZs reduce pollution, but effects vary due to external factors (e.g., weather, traffic trends). For example, London's ULEZ reportedly cut **PM<sub>2.5</sub>** by **27%** in its initial phase, while Bath's CAZ reduced **NO<sub>2</sub>** by **16%** despite pandemic-related traffic rebounds.

In summary, CAZs are a key tool in UK air quality policy, tailored regionally but unified in targeting transport emissions through charges, restrictions, and support measures.

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446

[2] Air quality targets - Detailed Evidence report.pdf | Score: 22.774

### DeepSeek, text, SBERT + FAISS

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to improve air quality by reducing emissions, particularly nitrogen dioxide (NO<sub>2</sub>), from road transport and other pollution sources. These zones aim to encourage the adoption of cleaner vehicles and technologies, such as low-emission or electric vehicles, through restrictions or financial incentives for higher-polluting vehicles.

#### ### **Implementation in the UK**

##### 1. **Legal Basis**:

- CAZs are established under the **Environment Act 2021** and local air quality management frameworks.
- Compliance aligns with **EU and national air quality objectives**, including WHO guidelines.

##### 2. **Types of CAZs**:

- **Charging Zones**: Higher-emission vehicles (e.g., older diesel or petrol vehicles) pay a fee to enter.
- **Non-Charging Zones**: Focus on infrastructure improvements (e.g., bus retrofitting, cycling lanes) without direct charges.

##### 3. **Devolved Approach**:

- **England**: Local authorities design and enforce CAZs, supported by UK government funding (£880 million allocated for plans and mitigation). Examples include:

- **Bath** (March 2021, first CAZ), **Birmingham** (June 2021), **Bristol** (November 2022), and **Bradford** (September 2022).

- **Scotland**: Integrated into the *Cleaner Air for Scotland 2* strategy, with a focus on transport decarbonisation.

- **Wales**: Collaborative measures (e.g., reduced speed limits, £25 million for mitigation in Caerphilly and Cardiff).

- **Northern Ireland**: Air quality strategies include CAZ-like measures, though implementation is less advanced.

##### 4. **Enforcement**:

- **Automatic Number Plate Recognition (ANPR)** cameras monitor compliance.
- Revenue funds local air quality initiatives, such as public transport upgrades.

##### 5. **Evaluation**:

- Annual reports assess effectiveness (e.g., *2020 Evaluation of Local NO<sub>2</sub> Plans*). Early results show reduced NO<sub>2</sub> in active zones.

#### ### **Objective**

CAZs aim to achieve legal air quality standards in the shortest time possible while balancing economic and social impacts. Their design prioritizes measures "at least as effective" as charging, tailored to local emission sources (e.g., fleet composition).

[1] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.570

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.549

[3] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.547

### DeepSeek, text, No-RAG

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to improve air quality by reducing emissions from the most polluting vehicles. These zones aim to tackle harmful pollutants such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM), which contribute to health problems like respiratory diseases and premature deaths.

### ### **\*\*Types of Clean Air Zones in the UK\*\***

The UK categorizes CAZs into four classes based on the vehicles they target:

- **\*\*Class A\*\***: Buses, coaches, taxis, private hire vehicles (PHVs)
- **\*\*Class B\*\***: Buses, coaches, taxis, PHVs, heavy goods vehicles (HGVs)
- **\*\*Class C\*\***: Buses, coaches, taxis, PHVs, HGVs, vans, minibuses
- **\*\*Class D\*\***: All the above, plus private cars (if local authorities choose to include them)

### ### **\*\*Implementation in the UK\*\***

#### 1. **\*\*Charging Mechanism\*\***:

- Non-compliant vehicles (usually older, higher-emission models) must pay a **\*\*daily charge\*\*** to enter the zone.
- Charges vary by city (e.g., Birmingham's Class D CAZ charges £8 for cars, £50 for HGVs).
- Some cities (like London's **\*\*Ultra Low Emission Zone (ULEZ)\*\***) have stricter standards and higher fees.

#### 2. **\*\*Exemptions & Support\*\***:

- Residents, disabled drivers, and emergency vehicles may get temporary exemptions.
- Some local authorities offer **\*\*grants or scrappage schemes\*\*** to help upgrade to cleaner vehicles.

#### 3. **\*\*Enforcement\*\***:

- **\*\*Automatic Number Plate Recognition (ANPR)\*\*** cameras check vehicles entering the zone.
- Non-payment leads to fines (e.g., £120 in Birmingham, reduced to £60 if paid early).

#### 4. **\*\*Current & Planned CAZs\*\***:

- **\*\*Bath (Class C)\*\***, **\*\*Birmingham (Class D)\*\***, **\*\*Bradford (Class C)\*\***, **\*\*Bristol (Class D)\*\***, **\*\*Portsmouth (Class B)\*\***, **\*\*Sheffield (Class C)\*\***
- **\*\*London's ULEZ\*\*** (more stringent than standard CAZs) covers all boroughs since 2023.

### ### **\*\*Impact & Criticism\*\***

- **\*\*Benefits\*\***: Improved air quality, reduced health risks, and encouragement of cleaner transport (electric/hybrid vehicles).
- **\*\*Criticism\*\***: Concerns over costs for businesses and low-income drivers, as well as debates over effectiveness vs. economic impact.

Would you like details on a specific city's CAZ?

## **DeepSeek, text, Hybrid-RAG**

### ### **\*\*Clean Air Zones (CAZ) in the UK\*\***

A **\*\*Clean Air Zone (CAZ)\*\*** is a designated area where targeted measures are implemented to improve air quality by discouraging the use of the most polluting vehicles. These zones aim to reduce harmful emissions, such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>2.5</sub>), which are linked to respiratory illnesses and environmental degradation [2][6].

### ### **\*\*Types of Clean Air Zones in the UK\*\***

The UK categorizes CAZs into four classes based on the vehicles they target:

- **\*\*Class A\*\***: Buses, coaches, taxis, private hire vehicles (PHVs)
- **\*\*Class B\*\***: Buses, coaches, taxis, PHVs, heavy goods vehicles (HGVs)
- **\*\*Class C\*\***: Buses, coaches, taxis, PHVs, HGVs, vans, minibuses
- **\*\*Class D\*\***: All the above **\*\*plus\*\*** private cars (if non-compliant)

### ### **\*\*Implementation in the UK\*\***

#### 1. **\*\*Charging vs. Non-Charging Zones\*\***

- **\*\*Charging CAZs\*\*** (e.g., Birmingham, Bristol) impose daily fees on non-compliant vehicles, while **\*\*non-charging zones\*\*** (e.g., Oxford's Zero Emission Zone) use traffic restrictions or retrofitting [1][6].



- London's **ULEZ** (Ultra Low Emission Zone), expanded in 2023, is a stricter variant covering all boroughs [1].

2. **Compliance Standards**

- Vehicles must meet **Euro emission standards** (e.g., Euro 6 for diesel, Euro 4 for petrol) or pay fees (typically £8–£100/day) [1][4].

3. **Enforcement**

- **ANPR cameras** enforce charges; fines for non-payment are £120 (reduced if paid early) [1].

4. **Exemptions & Support**

- Residents, disabled drivers, and emergency services may qualify for exemptions or discounts [1].

- Financial support (e.g., Birmingham's scrappage scheme) aids vehicle upgrades [1][6].

### **Current UK Clean Air Zones (2024)**

- **Birmingham (Class D)**: Charges non-compliant cars, vans, and lorries.

- **Bristol (Class C/D)**: Targets older diesel vehicles.

- **London ULEZ**: Expanded in 2023, now covers all boroughs [1].

- **Manchester**: Plans paused but under review [1][3].

- **Oxford (ZEZ)**: Bans most petrol/diesel vehicles [1][6].

### **Impact & Criticism**

- **Benefits**: Reduced NO<sub>2</sub> and PM<sub>2.5</sub> levels, linked to improved public health [2][6].

- **Criticisms**: Financial strain on businesses and low-income drivers [1][3].

For details on a specific city's CAZ or policy updates (e.g., Wales/Northern Ireland [3][5]), let me know!

**Key Enhancements:**

- Added PM<sub>2.5</sub> as a key pollutant, citing evidence on health impacts [2][6].

- Clarified London ULEZ expansion (2023) with source [1].

- Noted Manchester's paused status and potential revival [1][3].

- Strengthened exemptions/support details with evidence [1][6].

- Streamlined language for precision while retaining readability.

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446

[2] Air quality targets - Detailed Evidence report.pdf | Score: 22.774

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 22.192

[4] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.570

[5] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.549

[6] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.547

**DeepSeek, paragraph, TF-IDF + Cosine**

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to reduce air pollution, particularly from vehicular emissions. These zones typically restrict or charge the most polluting vehicles (e.g., older diesel or petrol vehicles) to encourage cleaner transport alternatives, such as electric vehicles, public transit, or cycling. The primary goal is to improve air quality and public health by lowering concentrations of harmful pollutants like nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM).

### **Implementation in the UK**

In the UK, Clean Air Zones are established and managed by local authorities, often with financial and regulatory support from the national government. Key aspects of implementation include:

1. **Identification of High-Pollution Areas**: Local councils assess air quality data to determine where CAZs are needed, often focusing on urban centers with persistent pollution exceedances.

2. **Zone Classification**: CAZs may vary in stringency, targeting specific vehicle types (e.g., buses, taxis, private cars) based on emission standards.
  3. **Charging or Restrictions**: Non-compliant vehicles may face daily charges to enter the zone, while some zones enforce outright bans.
  4. **Rollout and Enforcement**: Implementation involves public consultation, signage installation, and automated enforcement (e.g., cameras with number plate recognition).
  5. **Funding and Support**: The UK government provides grants to local authorities to assist with setup costs, infrastructure upgrades, and public awareness campaigns.
- Examples of implemented CAZs include **Bath (2021)**, **Birmingham (2021)**, **Bradford (2022)**, and **Bristol (2022)**, with additional zones planned for other cities. The approach is tailored to local conditions, ensuring compliance with national air quality objectives while minimizing economic disruption.

### DeepSeek, paragraph, BM25

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to reduce air pollution, particularly from vehicular emissions, with the aim of improving air quality and public health. In the UK, CAZs are established under a structured framework that guides local authorities in their development and enforcement.

### **Implementation in the UK**

1. **Legal and Policy Basis**
  - CAZs are part of broader national strategies, such as the **Clean Air Strategy (2019)**, which outlines commitments to reducing harmful pollutants.
  - The framework for Wales and other UK nations provides guidance to local authorities on establishing CAZs, including legal considerations and emission reduction targets.
2. **Design and Enforcement**
  - Local authorities assess pollution hotspots and determine whether a CAZ is necessary, often focusing on high-traffic urban areas.
  - Measures may include:
    - **Charging schemes** for high-emission vehicles (e.g., older diesel or petrol vehicles).
    - **Restrictions** on certain vehicle types entering the zone.
    - **Promotion of cleaner transport alternatives**, such as electric vehicles or public transit.
3. **Public Access to Information**
  - Air quality data, including pollution levels and CAZ boundaries, is made publicly available to ensure transparency and compliance.
4. **Objectives**
  - The primary goals are to reduce harmful pollutants (e.g., nitrogen dioxide, particulate matter), improve public health, and align with broader environmental targets.

By integrating regulatory measures, local authority action, and public engagement, Clean Air Zones serve as a key tool in the UK's efforts to combat air pollution.

### DeepSeek, paragraph, SBERT + FAISS

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to reduce airborne pollution, primarily through restrictions on high-emission vehicles or other polluting activities. The purpose of such zones is to improve air quality, protect public health, and enhance environmental conditions.

In the UK, CAZs are established by **local authorities** under a structured policy framework. Implementation involves:

1. **Assessment of Air Quality**: Local authorities evaluate pollution levels using monitored and modelled data. The UK is divided into **43 air quality assessment zones** (28 urban agglomerations and 15 non-urban regions), with compliance against legal pollution limits tracked annually.
  2. **Regulatory Measures**: Depending on local needs, CAZs may enforce charges or restrictions on vehicles that fail to meet emission standards (e.g., older diesel or petrol vehicles). Some zones may also target industrial or commercial emissions.
  3. **Guidance and Compliance**: National frameworks provide guidance to local councils on establishing CAZs, including legal considerations, public health justifications, and technical requirements for monitoring and enforcement.
- The rollout of CAZs is tailored to regional pollution challenges, ensuring alignment with broader UK air quality objectives while allowing flexibility for local adaptation.

### **DeepSeek, paragraph, No-RAG**

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to improve air quality by discouraging the most polluting vehicles from entering. The goal is to reduce harmful emissions, such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM), which contribute to health problems and environmental damage.

#### **Types of Clean Air Zones in the UK**

The UK categorizes CAZs into four classes based on the vehicles they target:

- **Class A**: Buses, coaches, taxis, private hire vehicles (PHVs)
- **Class B**: Buses, coaches, taxis, PHVs, heavy goods vehicles (HGVs)
- **Class C**: Buses, coaches, taxis, PHVs, HGVs, vans, minibuses
- **Class D**: All the above **plus** private cars (if non-compliant)

#### **Implementation in the UK**

##### **1. Charging vs. Non-Charging Zones**

- Some CAZs impose **daily fees** on non-compliant vehicles (e.g., older diesel or petrol vehicles that don't meet Euro 6/4 standards).
- Others use **non-charging measures**, such as traffic restrictions or retrofitting vehicles to reduce emissions.

##### **2. Current UK Clean Air Zones**

- **Bath (Class C)** – Charges non-compliant vans, taxis, and HGVs.
- **Birmingham (Class D)** – Charges non-compliant cars, vans, taxis, and HGVs.
- **Bristol (Class D)** – Similar to Birmingham, with charges for older vehicles.
- **Sheffield (Class C)** – Targets buses, taxis, HGVs, and vans.
- **Greater Manchester (Under Review)** – Plans for a CAZ were paused in 2022 for further consultation.
- **London (ULEZ – Ultra Low Emission Zone)** – More stringent than CAZs, covering most vehicles and expanding to all London boroughs in 2023.

##### **3. How to Check Compliance & Charges**

- Drivers can check if their vehicle meets standards via the **[UK Government's CAZ checker]**(<https://www.gov.uk/clean-air-zones>).
- Fees typically range from **£8–£100 per day**, depending on vehicle type.

##### **4. Exemptions & Support Schemes**

- Some cities offer **temporary exemptions** (e.g., for residents or low-income drivers).
- Grants or loans may be available to upgrade to cleaner vehicles.

#### **Purpose & Impact**

CAZs aim to:

- ✓ Reduce air pollution-related illnesses (e.g., asthma, heart disease).
- ✓ Encourage a shift to electric/hybrid vehicles and public transport.
- ✓ Help the UK meet legal air quality targets.

Would you like details on a specific city's CAZ?

### DeepSeek, paragraph, Hybrid-RAG

A **Clean Air Zone (CAZ)** is a designated area where targeted measures are implemented to improve air quality by discouraging the use of the most polluting vehicles. These zones aim to reduce harmful emissions, such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM), which contribute to health problems and environmental damage. Clean air is a basic requirement for public health, and poor air quality poses significant risks [1].

#### Types of Clean Air Zones in the UK

The UK categorizes CAZs into four classes based on the vehicles they target, guided by frameworks that help local authorities determine appropriate measures [2]:

- **Class A**: Buses, coaches, taxis, private hire vehicles (PHVs)
- **Class B**: Buses, coaches, taxis, PHVs, heavy goods vehicles (HGVs)
- **Class C**: Buses, coaches, taxis, PHVs, HGVs, vans, minibuses
- **Class D**: All the above **plus** private cars (if non-compliant)

#### Implementation in the UK

##### 1. Charging Mechanism:

- Non-compliant vehicles (usually older, diesel, or high-emission models) must pay a **daily charge** to enter the zone.
- Charges vary by city (e.g., Birmingham charges £8 for cars, £50 for HGVs).
- Compliance is checked via **Automatic Number Plate Recognition (ANPR)** cameras [4].

##### 2. Exemptions & Support Schemes:

- Some cities offer temporary exemptions (e.g., for residents, disabled drivers).
- Financial support (grants or loans) may be available to upgrade to cleaner vehicles, with government funding granted to local authorities for this purpose [6].

##### 3. Current & Planned CAZs in the UK:

- **Bath (Class C)** – Live since March 2021
- **Birmingham (Class D)** – Live since June 2021
- **Portsmouth (Class B)** – Live since November 2021
- **Bradford (Class C)** – Live since September 2022
- **Bristol (Class D)** – Live since November 2022
- **Sheffield (Class C)** – Live from February 2023
- **Greater Manchester (Under review)** – Plans delayed due to public backlash [4]
- **London (ULEZ, stricter than CAZ)** – Expanded to cover all boroughs in August 2023

#### Impact & Criticism

- **Positive**: Improved air quality, reduced pollution-related illnesses, supported by local air quality assessments and national reporting [5].
- **Negative**: Concerns over costs for businesses and low-income drivers, with some opposition delaying rollout in areas like Greater Manchester [4].

Would you like details on a specific city's CAZ?

[1] Air quality\_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 28.328

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 25.870

- [3] Guide to UK Air Pollution Information .pdf | Score: 25.788  
[4] environmental-improvement-plan-2023.pdf | Score: 0.744  
[5] Air quality policies, proposals and concerns.pdf | Score: 0.708  
[6] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 0.537

### **LLaMa ,text, TF-IDF + Cosine**

The provided information does not explicitly mention "Clean Air Zones" (CAZs). However, it does discuss air quality management (AQM) and the implementation of Air Quality Management Areas (AQMAs) in the UK.

In the UK, AQMAs are designated areas where air quality objectives set by the European Union have not been met or are likely to be exceeded. Local authorities are responsible for implementing AQMAs, which involves identifying the main sources of pollutants, developing strategies to reduce emissions, and monitoring air quality.

While the term "Clean Air Zone" is not used, the information suggests that AQMAs are implemented through a combination of measures, including:

1. Identifying main sources of pollutants: Local authorities identify the sources of pollutants contributing to poor air quality in their area.
2. Developing strategies: Authorities develop strategies to reduce emissions from these sources, which may include measures such as improving fuel efficiency, promoting cleaner fuels, and increasing public transport.
3. Monitoring air quality: Authorities monitor air quality to ensure that the designated AQMA is meeting the required standards.
4. Reporting and review: Authorities submit annual progress reports and review their strategies to ensure they are effective in improving air quality.

In summary, while the term "Clean Air Zone" is not used, the information suggests that AQMAs are implemented in the UK through a combination of measures aimed at reducing emissions and improving air quality in designated areas.

- [1] Guide to UK Air Pollution Information .pdf | Score: 0.202  
[2] Air quality - GOV.UK.pdf | Score: 0.200  
[3] air\_pollution\_uk\_2023\_issue\_1.pdf | Score: 0.183

### **LLaMa, text, BM25**

A Clean Air Zone (CAZ) is a designated area in the UK where local authorities charge road users for entering the zone if their vehicles do not meet specific emissions standards. The purpose of CAZs is to reduce air pollution in cities by incentivizing the use of cleaner vehicles.

In the UK, CAZs are implemented under the powers granted by the Transport Act 2000 and the Environment Act 2021. The Mayor of London has the authority to establish a CAZ in London, which is currently known as the Ultra Low Emission Zone (ULEZ). The ULEZ charges drivers of non-compliant vehicles for entry into the zone.

Other cities in England, such as Bristol and Greater Manchester, have also established CAZs. The implementation of CAZs typically involves the following steps:

1. Designation of the CAZ area: The local authority designates the area where the CAZ will operate.
2. Vehicle standards: The local authority sets emissions standards for vehicles that are allowed to enter the CAZ.
3. Charging: Non-compliant vehicles are charged for entry into the CAZ.
4. Enforcement: The local authority enforces the charging scheme and provides exemptions for certain vehicles.
5. Scrappage schemes: The local authority may offer incentives, such as scrappage schemes, to encourage the replacement of older, polluting vehicles with cleaner alternatives.

The implementation of CAZs is intended to reduce air pollution in cities, improve public health, and meet legal air quality limits.

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446

[2] Air quality targets - Detailed Evidence report.pdf | Score: 22.774

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 22.192

### **LLaMa, text, SBERT + FAISS**

A Clean Air Zone (CAZ) is a designated area where measures are implemented to reduce air pollution, particularly nitrogen dioxide (NO<sub>2</sub>) concentrations. In the UK, CAZs are introduced by local authorities, with the support of the UK Government, to address exceedances of EU and national air quality objectives.

The implementation of CAZs in the UK involves a range of interventions, including:

1. Charging fees for non-compliant vehicles: Vehicles that do not meet emissions standards are charged a fee to enter the CAZ.
2. Low Emission Zones (LEZs): LEZs are designated areas where only low-emission vehicles are allowed to operate.
3. Clean Air Routes: These are designated routes that are restricted to low-emission vehicles.
4. Traffic management measures: Measures such as traffic calming, speed limits, and traffic signal optimization are implemented to reduce traffic congestion and emissions.
5. Public awareness campaigns: Educational campaigns are conducted to raise awareness about the importance of reducing air pollution and the measures being implemented to achieve this goal.

The first CAZ was introduced in Bath in 2021, followed by Birmingham, Bradford, and Bristol. Further CAZs are expected to be implemented in other areas to reduce NO<sub>2</sub> concentrations and meet air quality objectives.

[1] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.570

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.549

[3] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.547

### **LLaMa, text, No-RAG**

A Clean Air Zone (CAZ) is a designated area where measures are taken to reduce air pollution from vehicles, typically by charging fees or restricting access to vehicles that do not meet certain emissions standards. The goal of a CAZ is to improve air quality and reduce the negative impacts of air pollution on human health and the environment.

In the UK, Clean Air Zones are being implemented by local authorities, in collaboration with central government, to meet the country's air quality targets. The UK has set a target to reduce nitrogen dioxide (NO<sub>2</sub>) levels to 40 micrograms per cubic meter by 2025, and CAZs are a key part of this strategy.

Here's how CAZs are implemented in the UK:

1. **\*\*Designation\*\***: Local authorities identify areas with poor air quality and designate them as Clean Air Zones.
2. **\*\*Emissions standards\*\***: The authorities set emissions standards for vehicles, typically based on the Euro emissions standards. For example, vehicles that meet Euro 4 or Euro 6 standards may be exempt from charges.
3. **\*\*Charging\*\***: Vehicles that do not meet the emissions standards are charged a fee to enter the CAZ. The charge is typically levied on the vehicle owner, not the driver.
4. **\*\*Exemptions\*\***: Certain vehicles, such as public transport, emergency services, and historic vehicles, may be exempt from charges.
5. **\*\*Enforcement\*\***: The authorities use cameras and other technologies to monitor vehicle emissions and enforce the charging regime.
6. **\*\*Public engagement\*\***: Local authorities engage with the public, businesses, and other stakeholders to raise awareness of the CAZ and its benefits.

Types of Clean Air Zones in the UK:

1. **\*\*Charging CAZ\*\***: Vehicles that do not meet the emissions standards are charged a fee to enter the zone.
2. **\*\*Low Emission Zone (LEZ)\*\***: Vehicles that do not meet the emissions standards are banned from entering the zone.
3. **\*\*Clean Air Zone with exemptions\*\***: Vehicles that do not meet the emissions standards are charged a fee, but certain vehicles, such as public transport, are exempt.

Examples of Clean Air Zones in the UK:

1. **\*\*Birmingham CAZ\*\***: A charging CAZ in Birmingham, which started operating in June 2021.
2. **\*\*Leeds CAZ\*\***: A charging CAZ in Leeds, which started operating in March 2022.
3. **\*\*Manchester CAZ\*\***: A charging CAZ in Manchester, which started operating in May 2022.
4. **\*\*London LEZ\*\***: A Low Emission Zone in London, which has been in operation since 2008.

Overall, Clean Air Zones are an important tool for improving air quality in the UK, and their implementation is expected to have significant benefits for public health and the environment.

### **LLaMa, text, Hybrid-RAG**

A Clean Air Zone (CAZ) is a designated area where measures are taken to reduce air pollution from vehicles, typically by charging fees or restricting access for vehicles that do not meet certain emissions standards. The goal of a CAZ is to improve air quality by reducing the amount of pollutants, such as nitrogen oxides (NOx), particulate matter (PM), and other harmful emissions, in the air [2].

In the UK, Clean Air Zones are being implemented by local authorities, in collaboration with central government, to comply with the UK's air quality targets and the European Union's (EU) Ambient Air Quality Directive [1]. The UK's Air Quality Plan, published in 2017, sets out a framework for local authorities to develop and implement CAZs [1].

Here's how CAZs are implemented in the UK:

1. **\*\*Designation\*\***: Local authorities identify areas with poor air quality and designate them as CAZs. These areas are typically urban centers, such as city centers, industrial estates, or ports [1].
2. **\*\*Emissions standards\*\***: The local authority sets emissions standards for vehicles, which are typically based on the Euro emissions standards. Vehicles that meet these standards are exempt from charges or restrictions [1].
3. **\*\*Charging\*\***: Vehicles that do not meet the emissions standards are charged a fee to enter or operate within the CAZ. The charge is typically based on the vehicle's emissions level, with higher-emitting vehicles paying more [1].
4. **\*\*Exemptions\*\***: Certain vehicles, such as emergency services, public transport, and historic vehicles, may be exempt from charges or restrictions [1].
5. **\*\*Enforcement\*\***: The local authority is responsible for enforcing the CAZ, which may involve installing cameras and sensors to monitor vehicle emissions and issuing fines to non-compliant vehicles [1].
6. **\*\*Public engagement\*\***: Local authorities engage with the public, businesses, and other stakeholders to raise awareness about the CAZ and its benefits, as well as to provide information on how to comply with the regulations [1].

Types of Clean Air Zones in the UK:

1. **\*\*Charging Clean Air Zone\*\***: Vehicles that do not meet the emissions standards are charged a fee to enter or operate within the CAZ.
2. **\*\*Low Emission Zone\*\***: Vehicles that do not meet the emissions standards are restricted from entering the CAZ, but no charge is applied.
3. **\*\*Clean Air Zone with restrictions\*\***: Vehicles that do not meet the emissions standards are restricted from entering certain areas within the CAZ, but no charge is applied.

Examples of Clean Air Zones in the UK:

1. **\*\*London's Ultra Low Emission Zone (ULEZ)\*\***: Launched in April 2019, the ULEZ charges drivers of non-compliant vehicles £12.50 per day to enter the zone [3].
2. **\*\*Birmingham's Clean Air Zone\*\***: Launched in June 2021, the zone charges drivers of non-compliant vehicles £8 per day to enter the zone [4].
3. **\*\*Leeds' Clean Air Zone\*\***: Launched in March 2022, the zone charges drivers of non-compliant vehicles £50 per day to enter the zone [5].

The implementation of Clean Air Zones in the UK is ongoing, with many more cities and towns expected to introduce their own CAZs in the coming years [6].

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 23.446

[2] Air quality targets - Detailed Evidence report.pdf | Score: 22.774

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 22.192

[4] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.570

[5] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.549

[6] Air Quality Strategy\_framework for local authority delivery.pdf | Score: 0.547



### **LLaMa, paragraph, TF-IDF + Cosine**

A Clean Air Zone (CAZ) is a designated area where specific measures are taken to reduce air pollution, primarily by limiting the use of certain vehicles or implementing alternative solutions. In the UK, the establishment of CAZs is often facilitated by government funding, which is granted to local authorities to support their efforts.

The implementation of CAZs in the UK typically involves a multi-step process. Initially, a local authority identifies the need for a CAZ in a particular area, often in response to high levels of air pollution. The authority then works with relevant stakeholders to develop a plan for the zone, which may include measures such as restrictions on vehicle use, alternative transportation options, and public awareness campaigns.

Once a plan is in place, the local authority implements the necessary measures to reduce air pollution in the designated area. This may involve the introduction of low-emission zones, where only certain types of vehicles are permitted, or the promotion of alternative modes of transportation, such as public transportation or cycling.

In the UK, several cities have already established CAZs, including Bath, Birmingham, Bradford, and Bristol. The successful implementation of these zones has paved the way for further expansion, with local councils working to establish additional CAZs in areas where they are deemed necessary.

[1] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 0.537

[2] Revised\_National\_Air\_Pollution\_Control\_Programme\_\_NAPCP\_.pdf | Score: 0.365

[3] environmental-improvement-plan-2023.pdf | Score: 0.318

### **LLaMa, paragraph, BM25**

A Clean Air Zone (CAZ) is a designated area where measures are implemented to reduce airborne pollution and improve air quality. The establishment of a CAZ is guided by a framework that considers various factors, including the level of air pollution, population density, and the potential impact on public health.

The implementation of a CAZ involves the creation of a designated area where specific measures are enforced to reduce emissions from various sources, such as transportation and industrial activities. These measures may include restrictions on the types of vehicles allowed to enter the area, fees or charges for polluting vehicles, and incentives for cleaner alternatives. The primary goal of a CAZ is to improve air quality, enhance public health, and promote a cleaner environment.

In the UK, the Clean Air Strategy provides a framework for the establishment of CAZs, outlining the considerations and requirements for their implementation. Local authorities are responsible for considering the establishment of CAZs in their areas, taking into account the specific needs and circumstances of their communities.

[1] Air quality\_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 28.328

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 25.870

[3] Guide to UK Air Pollution Information .pdf | Score: 25.788

### **LLaMa, paragraph, SBERT + FAISS**

A Clean Air Zone is a designated area where measures are taken to reduce airborne pollution. In the UK, Clean Air Zones are established by local councils, guided by a framework that provides considerations for establishing one. The framework describes the reasons for reducing airborne pollution, including improvements in the environment

and better health for all.

In the UK, the implementation of Clean Air Zones is facilitated by local councils, who consider options to establish such zones. The zones are designated based on air quality assessments, which are conducted annually and presented in a report. The report provides a summary of the UK's legal and policy framework, as well as information on how pollution is measured and modeled. The UK is divided into 43 zones for air quality assessment, including 28 agglomerations zones (large urban areas) and 15 non-agglomeration zones (larger regions outside urban areas). Compliance with pollution limits is monitored and reported for each zone, based on a combination of measured concentrations and modeling.

[1] environmental-improvement-plan-2023.pdf | Score: 0.744

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 0.709

[3] Air quality policies, proposals and concerns.pdf | Score: 0.708

### **LLaMa, paragraph, No-RAG**

A Clean Air Zone (CAZ) is a designated area where measures are put in place to reduce air pollution from vehicles, primarily by charging or restricting access to vehicles that do not meet certain emissions standards. The goal of a CAZ is to improve air quality and reduce the negative impacts of air pollution on public health and the environment.

In the UK, the government has introduced CAZs in several cities to tackle air pollution, which is a major public health concern. Here's how CAZs are implemented in the UK:

#### **\*\*Types of Clean Air Zones:\*\***

1. **\*\*Charging Clean Air Zones (CCAAs):\*\*** These zones charge drivers of non-compliant vehicles a daily fee to enter the zone. The fee is typically £8-£12.50 per day.
2. **\*\*Classical Clean Air Zones (CCAAs):\*\*** These zones restrict access to vehicles that do not meet emissions standards, often by limiting entry to certain types of vehicles or requiring them to use alternative routes.
3. **\*\*Low Emission Zones (LEZs):\*\*** These zones restrict access to vehicles that do not meet emissions standards, but do not charge a fee.

#### **\*\*Implementation Process:\*\***

1. **\*\*Air Quality Assessment:\*\*** The local authority assesses the air quality in the area and determines the need for a CAZ.
2. **\*\*Designation:\*\*** The local authority designates the area as a CAZ and defines the boundaries, operating hours, and rules for the zone.
3. **\*\*Public Consultation:\*\*** The local authority holds a public consultation to gather feedback from residents, businesses, and other stakeholders on the proposed CAZ.
4. **\*\*Regulations:\*\*** The local authority develops regulations outlining the rules for the CAZ, including the types of vehicles allowed, charging fees, and enforcement measures.
5. **\*\*Enforcement:\*\*** The local authority enforces the CAZ regulations, using a combination of cameras, sensors, and manual checks to monitor vehicle emissions and collect fees.
6. **\*\*Monitoring and Evaluation:\*\*** The local authority monitors the effectiveness of the CAZ and evaluates its impact on air quality and public health.

### **\*\*Examples of Clean Air Zones in the UK:\*\***

1. **\*\*Birmingham:\*\*** The city has introduced a CCAZ, which charges drivers of non-compliant vehicles a daily fee to enter the zone.
2. **\*\*Leeds:\*\*** The city has introduced a CCAZ, which charges drivers of non-compliant vehicles a daily fee to enter the zone.
3. **\*\*London:\*\*** The city has introduced an Ultra Low Emission Zone (ULEZ), which charges drivers of non-compliant vehicles a daily fee to enter the zone.
4. **\*\*Manchester:\*\*** The city has introduced a CCAZ, which charges drivers of non-compliant vehicles a daily fee to enter the zone.

Overall, Clean Air Zones are an important step towards reducing air pollution in the UK and improving public health. By implementing these zones, cities can encourage the adoption of cleaner vehicles and reduce the negative impacts of air pollution on residents and the environment.

### **LLaMa, paragraph, Hybrid-RAG**

A Clean Air Zone (CAZ) is a designated area in a city or town where specific measures are implemented to reduce air pollution, primarily from vehicles. The goal is to improve air quality and public health by limiting or restricting access to polluting vehicles. In the UK, Clean Air Zones are being introduced in various cities to comply with EU air quality standards and reduce nitrogen dioxide (NO<sub>2</sub>) emissions, as outlined in the UK's Air Quality Plan [1].

### **\*\*Key features of a Clean Air Zone:\*\***

1. **\*\*Designated area\*\*:** A specific geographic area within a city or town where the Clean Air Zone is implemented, as defined by the local authority [2].
2. **\*\*Vehicle restrictions\*\*:** Vehicles that do not meet certain emission standards or are not compliant with the zone's rules are restricted or charged to enter the area, as outlined in the Clean Air Zone framework for Wales [2].
3. **\*\*Emission standards\*\*:** Vehicles are categorized based on their emissions, with stricter standards for newer vehicles, as specified in the UK's Air Quality Plan [1].
4. **\*\*Charging or restrictions\*\*:** Vehicles that do not meet the emission standards may be charged a fee to enter the zone or restricted from entering the zone altogether, as seen in the implementation of London's Ultra Low Emission Zone (ULEZ) [3].

### **\*\*Types of Clean Air Zones in the UK:\*\***

1. **\*\*Class C CAZ\*\*:** The most stringent type, where only the most polluting vehicles (those that do not meet Euro 6 standards) are charged to enter the zone, as seen in London's ULEZ [3].
2. **\*\*Class B CAZ\*\*:** Vehicles that do not meet Euro 6 standards are charged to enter the zone, but those that meet Euro 6 standards are exempt, as seen in the proposed implementation of Birmingham's Clean Air Zone [4].
3. **\*\*Class D CAZ\*\*:** A lower-emission zone, where only the most polluting vehicles (those that do not meet Euro 4 standards) are charged to enter the zone, as seen in the proposed implementation of Leeds' Clean Air Zone [4].

## **\*\*Implementation in the UK:\*\***

The UK government has set a deadline for cities to introduce Clean Air Zones to meet EU air quality standards, as outlined in the UK's Air Quality Plan [1]. Some cities have already implemented CAZs, while others are planning to introduce them in the coming years. Here are a few examples:

1. **\*\*London\*\***: London's ULEZ is a Class C CAZ, which charges drivers of non-compliant vehicles a daily fee to enter the zone [3].
2. **\*\*Birmingham\*\***: Birmingham's Clean Air Zone is a Class C CAZ, which will charge drivers of non-compliant vehicles a daily fee to enter the zone [4].
3. **\*\*Leeds\*\***: Leeds' Clean Air Zone is a Class D CAZ, which will charge drivers of non-compliant vehicles a daily fee to enter the zone [4].
4. **\*\*Manchester\*\***: Manchester's Clean Air Zone is a Class C CAZ, which will charge drivers of non-compliant vehicles a daily fee to enter the zone [5].

## **\*\*Benefits of Clean Air Zones:\*\***

1. **\*\*Improved air quality\*\***: By reducing emissions, CAZs help to decrease air pollution and improve public health, as seen in the UK's Air Quality Plan [1].
  2. **\*\*Increased public awareness\*\***: CAZs raise awareness about the importance of reducing emissions and promote the adoption of cleaner vehicles, as seen in the implementation of London's ULEZ [3].
  3. **\*\*Economic benefits\*\***: CAZs can generate revenue for cities through charging fees, which can be used to fund clean transportation initiatives, as seen in the proposed implementation of Birmingham's Clean Air Zone [4].
- Overall, Clean Air Zones are an important step towards reducing air pollution and improving public health in the UK, as outlined in the UK's Air Quality Plan [1].

[1] Air quality\_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 28.328

[2] clean-air-plan-for-wales-healthy-air-healthy-wales.pdf | Score: 25.870

[3] Guide to UK Air Pollution Information .pdf | Score: 25.788

[4] environmental-improvement-plan-2023.pdf | Score: 0.744

[5] Air quality policies, proposals and concerns.pdf | Score: 0.708

[6] Clean Air Zones, Low Emission zones and the London ULEZ.pdf | Score: 0.537