



# National Low Emission Framework

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## **1. Introduction**

### **1.1 Purpose**

1.1.1 The National Low Emission Framework (NLEF) is an air quality-focused, evidence-based appraisal process developed to help local authorities consider transport related actions to improve local air quality, where transport is identified as the key contributor to air quality problems.

1.1.2 The NLEF supports and builds on the work already being done through the Local Air Quality Management (LAQM) system.

1.1.3 Local authorities in Scotland should have regard to NLEF when undertaking their local air quality management duties, as required under section 88(2) of the Environment Act 1995.

1.1.4 Local authorities that have declared Air Quality Management Areas (AQMAs) should have regard to the NLEF when developing their air quality action plans.

1.1.5 The guidance should be considered in conjunction with the LAQM Policy Guidance PG(S)(16) and LAQM Technical Guidance TG(16).

### **1.2 Context**

1.2.1 The vision set out in Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is for Scotland to have the best air quality in Europe and to protect and enhance health, wellbeing and the environment and ensure placemaking and sustainable economic growth are supported by improved air quality across Scotland.

1.2.2. The NLEF will contribute to this by assisting in the consideration of actions that will reduce the impacts of pollutants such as nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM) in a way that supports public health and the local economy, making urban areas more attractive places to live, work, do business and spend leisure time.

1.2.3 The NLEF also has a correlation to the National Transport Strategy key strategic outcomes, which has a particular focus on reducing emissions to tackle climate change, air quality, health improvement, along with cross-over to elements such as congestion and accessibility.

### 1.3 Aims and objectives

1.3.1 The primary aim of the NLEF is to improve local air quality in areas where Scottish Air Quality Objectives (AQOs) are exceeded, or likely to be exceeded, and transport is identified as the key contributor.

1.3.2 It may not be feasible to remove an exceedance of an AQO in a particular area through implementing any individual action identified through the NLEF appraisal process. The process will, however, support the consideration of actions that could reduce the magnitude, extent or timescale required to remove an exceedance.

1.3.3 The focus of any action considered under the NLEF should be on the particular pollutant or pollutants which exceed Scottish AQOs in an AQMA. Whilst an action focused on reducing NO<sub>2</sub> would also potentially result in a reduction in PM<sub>10</sub> and PM<sub>2.5</sub> concentrations, this should be considered a secondary benefit, rather than an absolute requirement. Care will, however, be required to ensure that actions do not have the unintended consequence of increasing levels of non-target pollutants.

1.3.4 Whilst actions to improve air quality could potentially result in a reduction in CO<sub>2</sub> emissions due to vehicle owners switching to electric vehicles or to other modes of transport, reducing CO<sub>2</sub> emissions is not a primary objective or requirement of actions being considered under the NLEF appraisal process. Local authorities are, however, encouraged to consider whether actions identified through the NLEF appraisal process can help support reductions in emissions of CO<sub>2</sub> within their areas where possible; e.g. by encouraging active travel and supporting the uptake of low emission vehicles so that benefits in both local air quality and emissions of greenhouse gases are realised together.

### 1.4 Roles and responsibilities

1.4.1 This guidance has been developed to support local authorities but is relevant to a range of organisations, including the Scottish Environment Protection Agency (SEPA) and the Scottish Government, who have an overseeing role to play in improving local air quality.

1.4.2 The NLEF appraisal should be a collaborative process between a range of local and national bodies.

1.4.3 Within local authorities a collaborative approach will be required, encompassing transport planning, traffic engineering, environmental health, sustainability, planning and legal and finance specialists. Input from those who have implemented transport schemes and those with air quality expertise will be key to ensuring that the NLEF appraisal process is undertaken in a robust manner.

1.4.4 Stage one of the NLEF process, the screening exercise, will be undertaken by local authorities using existing data, compiled as part of existing LAQM review, assessment and action planning duties and incorporating consideration of wider land use and transport planning work. Stage two, the assessment process, will be carried

out by local authorities supported by SEPA through the National Modelling Framework (NMF).

## **1.5 National Low Emissions Framework and Local Air Quality Management**

1.5.1 The NLEF is intended to support and complement the existing LAQM system which is already well defined and developed. Those local authorities with declared AQMAs are required to develop an air quality action plan within one year of declaration. This details the measures identified by the local authority as contributing to meeting the air quality objectives in the future.

1.5.2 The relationship between the LAQM system and the NLEF appraisal process is illustrated in the flowchart included as Figure 1 below.

1.5.3 The NLEF process will be undertaken by all local authorities with an AQMA where transport emissions are the primary reason for declaration and should form part of future air quality action planning. Results of the NLEF screening and, where appropriate, assessment processes will be reported in the Annual Progress Report (APR) submitted by local authorities in June of each calendar year.

1.5.4 The air quality action plan will also be updated with these findings and the proposals for measures to be implemented.

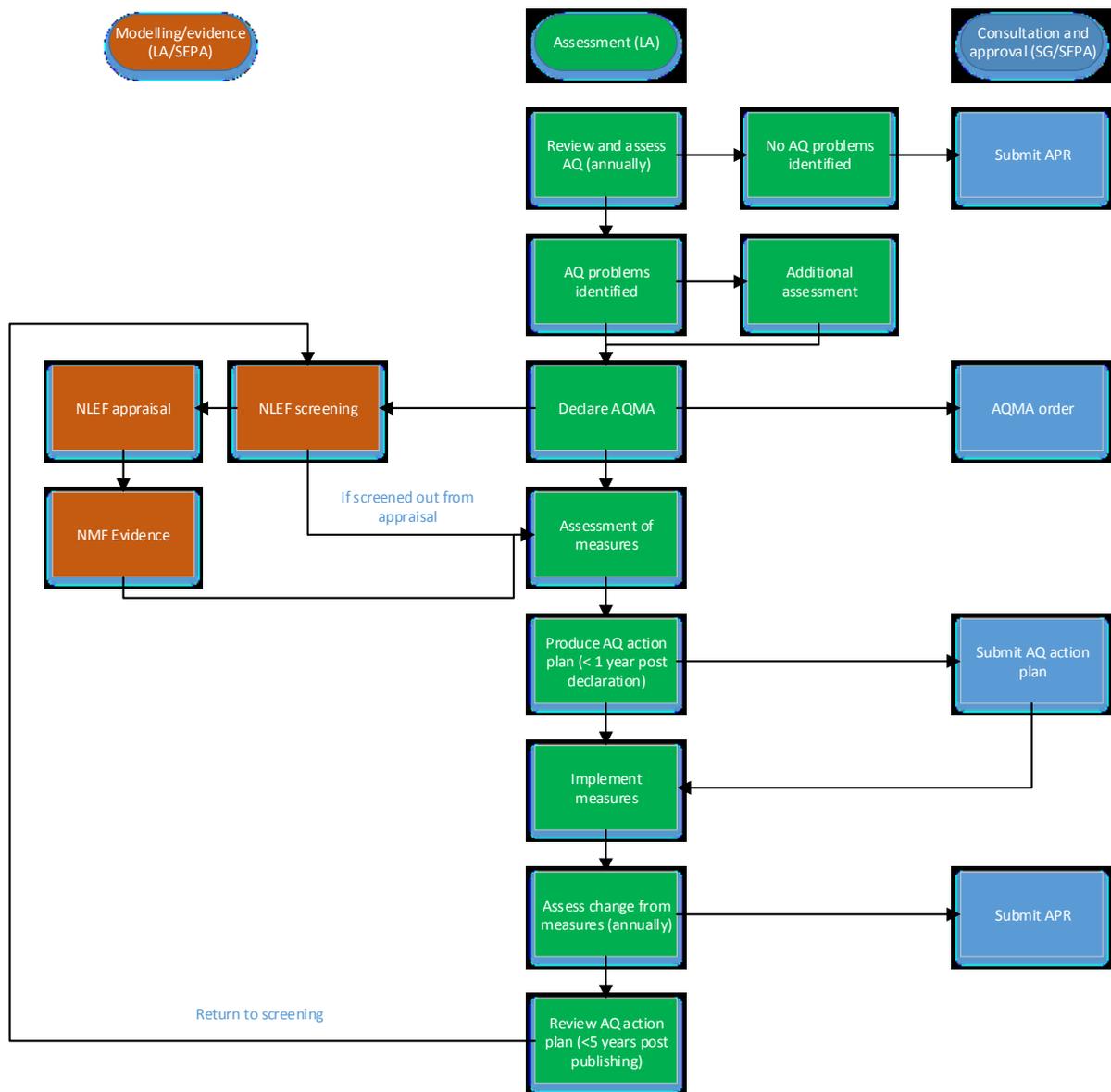


Figure 1 – Relationship between NLEF and LAQM system

## 1.6 National Modelling Framework

1.6.1 The National Modelling Framework (NMF) is a key strand of CAFS which will develop a national, two-tiered modelling approach for air quality within Scotland. The NMF aims to standardise data collection requirements, analysis processes and presentation of outputs to provide local authorities with information required to appraise measures for improving urban air quality.

1.6.2 The development of regional NMF models will support decision-making around placemaking and transport planning in relation to air quality management across city regions.

1.6.3 Local NMF models will represent a standardised approach to modelling air quality for local authorities undertaking a stage two NLEF assessment. The focus will be on identifying detailed traffic-related source apportionment across the appropriate area, with the outputs providing quantitative evidence to support decision-making, including on the potential benefits of introducing a Vehicle Access Restriction Scheme (VARS) to improve air quality.

1.6.4 It is expected that local NMF models will provide a significant proportion of the quantitative evidence required within the NLEF appraisal process, producing outputs and visualisation tools to aid decision-making.

1.6.5 In addition, the NMF will link traffic model outputs and air quality modelling, allowing local authorities to consider wider traffic management measures in the context of improving local air quality.

1.6.6 The NMF approach ensures that the analysis and generation of evidence to support decision-making is consistent across Scotland despite transport issues and sources of emissions differing between geographical areas.

## 1.7 Low Emission Zones

1.7.1 Cleaner Air for Scotland set out a number of measures for consideration as part of the NLEF, including Low Emission Zones, Clean Air Zones (as defined by the City of York in relation to buses, rather than as defined by Defra through work in the National Air Quality Action Plan), other Access Regulation Schemes, Traffic Management and Vehicle Licensing Regulations. With the exception of traffic management and vehicle licensing, all aim to restrict vehicles within a geographical zone, with the type of vehicles subject to restrictions dependent upon the objective set. For example, bus lanes generally restrict vehicles other than buses and taxis in order to improve the efficiency of bus operations.

1.7.2 In relation to improving air quality, in Clean Air Zones and Low Emission Zones the restrictions imposed are generally based on an emission standard. As such, these definitions have been brought together and will be referred to as Low Emission Zones (LEZs) throughout this document.

1.7.3 Scottish LEZs will be based on VARS which allow the exclusion of vehicles that do not meet the relevant criteria within a defined geographical area. The

relevant criteria will be based on a nationally agreed standard for emissions. Once an LEZ has been declared, affected vehicles would be required to meet the relevant emission standard in order to enter the designated area. Any vehicle not meeting the relevant emission standard (other than those exempt from the requirements) would be subject to a financial penalty.

1.7.4 LEZs are primarily intended to ensure the use of more polluting vehicles is reduced and that those vehicles which enter the zone meet more stringent emissions standards. The potential benefit comes from the reduction in emissions associated with vehicles. LEZs may also encourage consideration of modal shift to public transport and active travel with the potential for fewer vehicles overall to enter the zone.

1.7.5 There is the potential for vehicle access restrictions introduced for reasons other than air quality and other traffic management measures, such as changes to traffic light sequencing, to help improve air quality. It is anticipated that these options will be considered as part of stage one of the NLEF appraisal process. The NMF approach at stage two, whilst focusing on consideration of LEZs, will also provide information to support local authorities in considering a range of other transport-related actions.

1.7.6 This document does not include discussion of road access charging (i.e. zones which vehicle owners would be charged to access). The Scottish Government is committed to any vehicle access restrictions put in place to support air quality improvements being introduced on a penalty basis in order to incentivise compliance.

1.7.7 The NLEF approach will support:

- consideration of options that reflect specific, localised situations
- targeting locations where exceedances of air quality criteria are occurring or are likely to occur
- flexibility for local authorities to influence the specific vehicle class or classes that are the primary contributors to poor air quality in their area

1.7.8 The NLEF appraisal process will assist local authorities to determine whether an LEZ is appropriate to address air quality issues in their area. Where it is determined that an LEZ is an appropriate option, the process will help local authorities to define the boundary of the zone and to consider the scope of the vehicle classes to be included in order to achieve the air quality improvements required.

1.7.9 All vehicle types should be considered for inclusion in an LEZ and be assessed as part of the NLEF appraisal process. Depending upon the outcome, a single vehicle type or a combination of vehicle types could be subject to the LEZ requirements.

1.7.10 Generally, the more vehicle classes which are included in an LEZ then the greater the associated potential for improvement in local air quality. It will be particularly important to consider the scale of the air quality exceedances and the vehicle types which are making the most significant contribution as a key consideration in determining the requirements of any individual LEZ.

1.7.11 Further information on Low Emission Zones can be found in Appendix 2.

## 2. NLEF appraisal

### 2.1 NLEF appraisal process – key stages

2.1.1 The NLEF appraisal process provides a consistent approach that can be applied across Scotland to inform decisions on transport-related actions to improve local air quality. It will support local authorities in considering transport-related issues in the context of local air quality management and help develop evidence to support consideration of the introduction of an LEZ as an appropriate option to improve air quality.

2.1.2 It is intended to be a two stage process consisting of screening and assessment. It is not the intention that all local authorities will have to conduct the full NLEF appraisal.

2.1.3 The initial screening stage should be completed by local authorities that:

- have identified air quality problems (where transport is the primary cause) and declared an AQMA
- have identified potential air quality problems (where transport is the primary cause) which may lead to an AQMA declaration in the future

2.1.4 Where the screening exercise indicates that further assessment should be carried out, the local authority should proceed to stage two. At stage two, the NMF will support the identification of the scope and key contributors to air quality issues and provide the evidence to help assess potential benefits of transport-related actions to address those issues, with a focus on considering the introduction of an LEZ.

2.1.5 The two key stages in conducting a NLEF appraisal are summarised in Table 1 below.

Stage		Outcome	Actions required
1	Screening	<ul style="list-style-type: none"> <li>decision on whether to proceed to stage two assessment</li> </ul>	<ul style="list-style-type: none"> <li>screening process to identify actions that will benefit air quality within the AQMA</li> <li>screening evidence should form part of the Annual Progress Report, with the decision agreed by Scottish Government and SEPA</li> </ul>
2	Assessment	<ul style="list-style-type: none"> <li>decision to proceed with introduction of LEZ or identification of alternative transport-related measures required to improve air quality</li> <li>Stage two assessment report agreed by Scottish Government and SEPA</li> </ul>	<ul style="list-style-type: none"> <li>NMF approach to support assessment of sources of pollution and options</li> <li>quantitative impact assessment (based on predicted change in pollutant concentrations)</li> <li>consideration of consequential impacts (e.g. congestion, export of pollution)</li> </ul>

**Table 1**

## 2.2 NLEF stage one - screening

### Overview

2.2.1 Through the LAQM system, local authorities are required to review and assess air quality within their area on an annual basis and report the outcome via an Annual Progress Report (APR). Where an exceedance (or potential for exceedance) of the relevant air quality objectives is identified, it will result in the declaration of an Air Quality Management Area (AQMA) for the affected area or the situation will be kept under review as to whether an AQMA declaration is required in the future.

2.2.2 Where an AQMA is declared, local authorities are required to develop an air quality action plan (AQAP) which identifies the measures proposed to achieve compliance with the air quality objectives. Progress on AQAPs is also reported via the APR.

2.2.3 NLEF Screening will form part of the review and assessment process for APRs and AQAPs, where relevant. It is intended that the screening process will encompass a review of proposed actions across the range of local authority functions, with a particular focus on transport. This will allow local authorities to assess whether these actions are likely to lead to significant improvements in air quality within the AQMA, in line with the requirement to meet the air quality objectives in the shortest possible timescale.

2.2.4 Where the proposed actions do not support delivery of this requirement, local authorities should move to stage two of the NLEF appraisal, to assess the scope for

introducing an LEZ in support of meeting air quality objectives. The outcome of the screening exercise should be submitted as part of the APR and the AQAP should be updated.

2.2.5 The stage one screening exercise should use existing information and evidence from across the local authority's functions to identify and consider actions that could lead to improved air quality and contribute to the revocation of the AQMA.

2.2.6 Through the screening process, some AQMAs will be excluded from the need for further consideration through stage two assessment due to the nature of the AQMA (e.g. size, scale, contributing sources of pollution) or where other committed actions from the AQAP or other programme of work being undertaken by the local authority is likely to remove air quality exceedances in the shortest possible timescale.

2.2.7 In carrying out the screening, local authorities should consider all of their functions to ensure that any actions that could have an impact on air quality are taken account of.

2.2.8 It is intended that all local authorities with AQMAs will carry out the screening process for each AQMA where transport is a key contributor to exceedances. Local authorities will not be required to complete the NLEF screening where this is not the case.

2.2.9 Initially the results of the screening process, including the outcome of the analysis of the likelihood of removing air quality exceedances, will be reported by local authorities to Scottish Government and SEPA in a standalone report. In future years, it is intended that the screening will be reported through APRs and assessed by the Scottish Government and SEPA as part of the wider APR review process.

2.2.10 In those cases where the outcome of the screening exercise determines that an LEZ is a potentially appropriate option, the affected AQMA will move to the stage two assessment process.

2.2.11 It is anticipated that an LEZ is likely to be appropriate in circumstances where it cannot be demonstrated that committed measures are likely to remove air quality exceedances in the shortest possible timescale.

2.2.12 Should an AQMA be screened out on the basis of such committed action plan measures being in place, then it is expected that these measures will be delivered within the timescale defined in the AQAP.

2.2.13 An LEZ alone will not always be sufficient to improve air quality to a level which removes any exceedances and additional measures may need to be identified and implemented through the LAQM action planning process.

#### Screening – key stages

2.2.14 Existing air quality information, including data produced as part of the annual review and assessment process and air quality action plans, can be used in the

screening assessment. It is not anticipated that there will be a requirement for local authorities to collect new data or information during the screening stage of the appraisal process.

2.2.15 The following key steps should be undertaken as part of the screening exercise:

- Review of information on the main sources of poor air quality and other contributing factors within each AQMA. If transport is not a significant contributor within a particular AQMA, this AQMA should not be considered under the NLEF appraisal process.
- Analysis of existing data including air quality, traffic and environmental data as well as information on existing and future action planning measures across all local authority functions which seek to address or are likely to contribute to improving air quality
- Conduct the NLEF stage one screening process
- Record the results of the screening process and the decision as to whether proposed measures are sufficient or whether any AQMA requires to progress to a stage two assessment

Information to support the screening exercise is attached at Appendix 2.

2.2.16 Local authorities should submit the completed screening assessment and findings to the Scottish Government and SEPA for review and agreement. Where the findings demonstrate that committed measures are likely to remove air quality exceedances in the shortest possible timescale, and the Scottish Government and SEPA are in agreement with this conclusion, then no further work will be required under the NLEF appraisal process at this time. Scottish Government and SEPA may seek the opinion of Transport Scotland and other appropriate authorities before agreeing the screening outcome.

2.2.17 It is anticipated that existing measures identified as part of the LAQM action planning process will require to be implemented in accordance with stated timescales, irrespective of the need to progress to a stage two assessment.

#### Data requirements and analysis

2.2.18 Potential data sources will include:

- LAQM Review and Assessment reports
- outcomes of local modelling (where available)
- appraisals of major transport schemes
- land use proposals and/or assessments

- Annual Progress Reports and AQAP measures

2.2.19 For each AQMA, the main issues should be defined for any exceedances of the air quality objectives (AQO) for NO<sub>2</sub> and / or PM<sub>10</sub> and/or PM<sub>2.5</sub> with a focus on:

- the locations where Scottish AQOs for NO<sub>2</sub> and / or PM<sub>10</sub> and / or PM<sub>2.5</sub> concentrations are not being met (or may not be met)
- the sources and percentage split of sources contributing to exceedances of Scottish AQOs for NO<sub>2</sub>, PM<sub>10</sub> and / or PM<sub>2.5</sub> (e.g. road transport, rail transport, industry, etc.)
- where emissions from road transport are the significant contributor, the relative breakdown of the vehicle classes contributing to exceedances of Scottish AQOs for NO<sub>2</sub> and / or PM<sub>10</sub> and / or PM<sub>2.5</sub>; e.g. Heavy Goods Vehicles (HGVs), buses, taxis, cars, etc.

#### Defining the issues

2.2.20 Existing data, largely produced through the LAQM review and assessment process, including in APRs, should be summarised to:

- identify the main sources of emissions
- describe the main AQAP measures already being implemented by the local authority and their expected impacts on the levels of AQO exceedance
- identify whether there are any other committed actions that could help to in address the exceedance and the likely contribution to reducing exceedances

#### Screening outcome

2.2.21 The screening outcome should consider whether committed measures identified through the screening exercise will be likely to remove air quality exceedances in the shortest possible timescale.

2.2.22 It is anticipated that where the screening outcome finds that the committed measures are not likely to achieve this, then the affected AQMA should move to the stage two assessment.

2.2.23 If the air quality exceedance is very localised it may be more appropriate to address the issue by identifying additional location specific measures to be implemented through the AQAP, potentially through consideration of local transport measures. In this situation, the additional measures should be identified and the timescale for implementing them recorded in the screening outcome along with a description of the likely contribution to removing exceedances.

2.2.24 In other circumstances, it is likely that the AQMA could benefit from the introduction of an LEZ and should be progressed to stage two assessment.

### Reporting requirements

2.2.25 It is anticipated that local authorities will report the outcome of their first stage one screening exercise by 30 June 2019. Screening should then be undertaken on an annual basis as part of the annual assessment and review process and reported through the Annual Progress Report (APR).

2.2.26 In the event that SEPA and Scottish Government cannot reach an agreement with the local authority on the outcome of the NLEF screening process, further discussions will be required. In some circumstances, further insight into the planned actions or additional environmental information may add clarity and help in reaching agreement.

## 2.3. NLEF stage two – assessment

### Overview

2.3.1. The National Modelling Framework aims to standardise data collection requirements, analysis process and presentation of outputs to provide local authorities with information required to appraise measures for improving urban air quality. Local NMF models will represent a standardised approach to modelling air quality for local authorities undertaking a stage two assessment.

2.3.2 The stage two assessment will focus on:

- assessing the impact of potential LEZ options with regard to air quality
- identifying the preferred option, including consideration of geographical extent and scope of vehicles to be included
- considering the wider impacts of the preferred option
- supporting identification of the costs associated with implementing the preferred option

### Objective setting

2.3.3 The starting point for the stage two assessment process will be to define the objectives for the potential LEZ, taking account of the pollutant(s) of concern and with regard to any available information on source apportionment that identifies particular vehicle types that are a significant contributor to any air quality exceedances.

### Defining size and boundaries of options for consideration

2.3.4 The indicative boundary of potential options for consideration should be defined at the outset, taking account of local circumstances. Potentially, more than one boundary may be considered. For example, the AQMA boundary or one which covers just a few streets with the highest concentrations of air pollutants.

2.3.5 The area for consideration will be informed by:

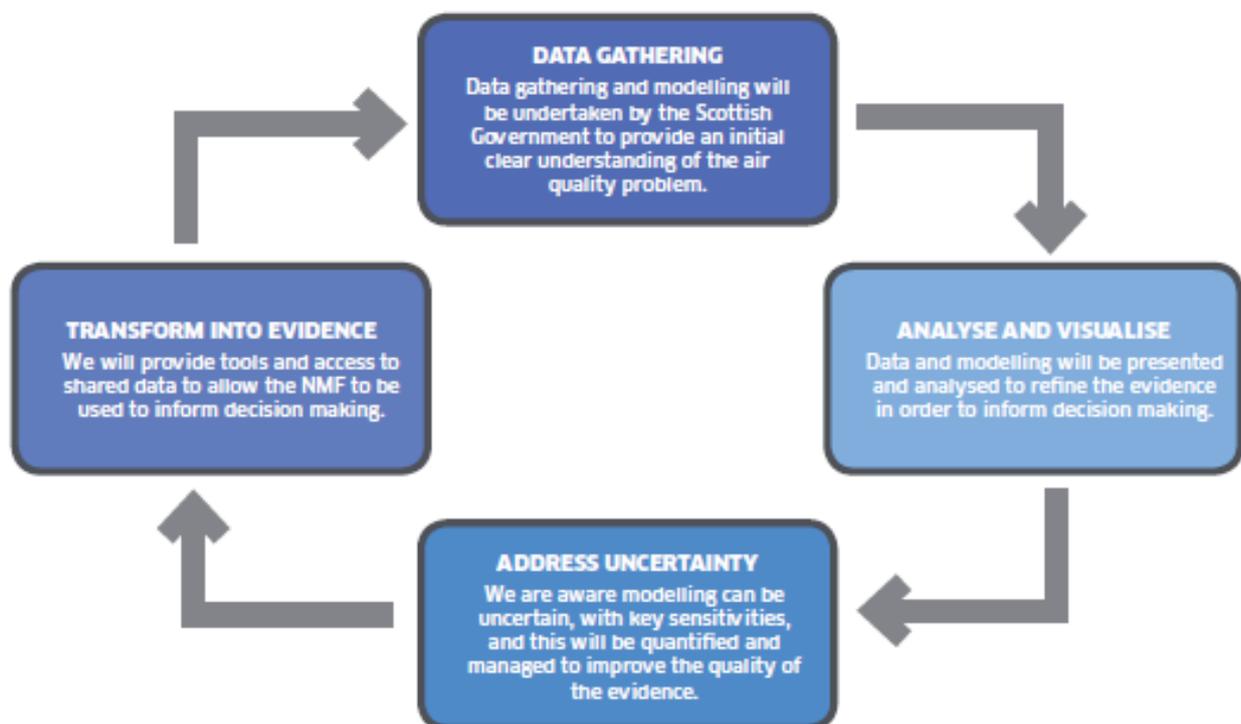
- the area of exceedance of air quality objectives and the main sources of pollutants
- geographically discrete areas, such as a town centre, or other areas which are well defined (e.g. within an inner ring road)
- features that may influence enforcement (e.g. an outer ring-road with junctions leading into exceedance areas, key access points such as bridges)
- the potential need to allow vehicles to divert onto alternative routes to avoid the area of the LEZ

- air quality along any such alternative routes to determine if they could be at risk of new exceedances as a result of displaced traffic
- mapped emissions by vehicle type in order to identify areas where options are likely to be most effective. Mapping bus routes, taxi ranks and/or residential and commercial land-uses will be useful.

2.3.6 The size and extent of areas should be designed to meet the objectives that have been set for the LEZ but there is likely to be a range of other issues that will require to be considered such as access and traffic management and the effect on surrounding roads.

#### National Modelling Framework approach

2.3.7 The NMF provides a standardised approach to modelling air quality to support consideration of LEZs. New tools have been developed to ensure that the data is presented in a standardised way that supports the decisions-making process to help improve air quality. The NMF ensures that the analysis and generation of evidence to support decision-making is consistent across those local authorities undertaking the stage two assessment. SEPA will support local authorities throughout stage two assessment and the decision-making process, through the development of the NMF local model.



**Figure 2 - National Modelling Framework – generating evidence**

2.3.8 The NMF local models will utilise ADMS-Urban, a recognised system that is used around the world for modelling all aspects of air pollution across large urban areas. The model:

- can simulate details on a range of scales, from street-to-street to city-wide
- take account of the full range of pollution sources, including traffic
- include an advanced description of meteorology, taking account of vertical changes in wind speed to allow for detailed characterisation of atmospheric turbulence and stability
- include the effect of buildings on dispersion and the mixing of pollution induced by vehicles
- the effect of chemical reactions on pollutant concentrations

2.3.9 An ADMS model for each option being considered will be built by quantifying emissions from a range of sources. Emissions from major roads will be defined explicitly in the model based on detailed traffic-count data and operator information. Good quality detailed traffic data is essential for good model performance and SEPA will work with the local authorities to ensure that the data is collected and presented in a format that aids decision making.

2.3.10 Other sources of pollution in the model include residential and industrial combustion, industry, waste, minor roads, shipping and railways. Emissions from these sources are not defined explicitly. Instead, emissions are derived from published UK National Atmospheric Emissions Inventory 1km<sup>2</sup> emission grids. Where other significant sources are identified, such as largescale industrial emissions, shipping or major road networks (such as motorways), these will be assessed appropriately to ensure they are defined explicitly in the model. Finally, some pollution in the area will have been transported from outside of the region. These sources are represented in the model by 'background' measurements of pollution taken from an appropriate rural monitoring station. For comparison, Urban Background monitoring data will also be used to represent the effect of emissions from sources other than the main roads.

2.3.11 The model includes accurate dimensions of city streets which will be derived using Geographical Information Systems (GIS). These dimensions include the width and height of each road, as well as the width and height of the street 'canyon', as created by the surrounding buildings. This means the model can reproduce the 'trapping' of pollutants within some narrow streets.

2.3.12 The model uses hourly meteorological data from the most appropriate Met Office station for each proposed LEZ area. Meteorological data is used to calculate how well all sources of pollution are mixed and transported within, and across, the urban area.

2.3.13 Detailed traffic data will be collected for each proposed LEZ area to ensure an accurate representation across the road network. Data collection is processed to give Annual Average Daily Flow (AADF) (i.e. the typical number of vehicles driving along each road section during a 24 hour period). The traffic data collection process will aim to provide detailed traffic composition, so that vehicles can be classified into 11 different vehicle categories – motorcycle, car, taxi, light-goods vehicle (LGV),

bus/coach (PSV) and six different types of heavy-goods vehicle (HGV) and pedal cycles. In addition, a smaller amount of very detailed data, collected through the recording of vehicle number-plates, will be analysed using information from the DVLA database. SEPA will work with the local authority to ensure the traffic data is collected in a manner that can be utilised within the NMF and future traffic models.

2.3.14 Local authorities will be responsible for the development of any traffic model that is deemed necessary for the assessment process. SEPA will work with the traffic modellers to ensure that the outputs are transferrable to assess local air quality issues in relation to modelled traffic changes.



**Figure 3 - Example of detailed traffic collection points, including turn counts, 12/24 traffic count locations and ANPR (data collected in Glasgow during winter 2017/18)**

2.3.15 Local bus operator data, collected directly for individual routes that operate within the modelled area, will ensure the correct proportions of Euro engine classifications are used within the model.

2.3.16 Compiled traffic data and other information detailed above are fed into the air quality model and the performance of the model can be checked against observed data.

2.3.17 The traffic information provides a rich source of data which forms part of the evidence for the development of appropriate interventions. Additionally, the data will be collected in such a way as to ensure that it can be used within the development of detailed traffic models in order to run traffic scenarios to help understand altered traffic flows. These outputs can then be used within ADMS to assess changes in air pollution concentrations. SEPA will work with the local authorities to provide appropriate interactive tools for using the data.

2.3.18 Model outputs are visualised using the interactive TIBCO Spotfire® software. This provides an interactive platform for sharing data outputs and building/presenting scenarios. Modelled data is presented as predicted annual mean concentrations at

kerbside points along every road in the modelled area. This makes it possible for exceedances at other locations to be identified. Some of these points correspond to monitoring stations, where the model concentration can be compared against observed values to help validate the model outputs.

2.3.19 The sensitivity of the model predictions are explored under varying individual modelled parameters and varying metrological conditions. Computational Fluid Dynamic (CFD) models are used to identify complex air flow issues around specific monitoring stations or locations identified within the modelling domain. Although the CFD model does not represent the mass concentration of a pollutant, it allows the illustration of potential dead zones or areas of high flush, which would perhaps be missed elsewhere. This is useful where modelled predictions cannot be reproduced due to localised air flow issues.

2.3.20 The NMF local model will be used to estimate the contribution of each source to total pollution levels in the defined area. At kerbside locations, the contribution from road traffic is calculated against background pollution data. Estimates of contributions from vehicle types are calculated to provide the greatest contributors to the road-traffic component of air pollution in the area.

2.3.21 Detailed traffic count data is linked to an emission database to highlight the relative importance of different vehicles types.

2.3.22 The NMF local model will be used to estimate the potential improvement in air quality by removing, or reducing emissions from, all or part of the vehicle fleet. These traffic scenarios will be applied within the boundaries of the options identified. Scenarios could include removing diesel vehicles, restricting buses to EURO VI emission standards (including retrofit) or quantifying the effect of newer vehicles entering the fleet due to natural turnover.

## **2.4 Stakeholder input and consultation**

2.4.1 The introduction of an LEZ has the effect of restricting access to the designated zone for non-compliant vehicles. This will impact on all those who wish to access the area in a vehicle, with the potential to affect bus service operators, businesses and individuals. It will be critical to engage with key stakeholders from the outset of the stage two assessment process to obtain data to support the assessment and to gather information on the potential issues that will inform potential LEZ options and will be critical to the design and implementation of any future LEZ.

## 2.5 Wider considerations

2.5.1 As part of the stage two assessment, local authorities should consider the potential for environmental impacts beyond air quality that could be associated with the introduction of an LEZ or, in some cases, other transport-related measures.

2.5.2 These considerations will be at a high-level, reflecting the early stage of development of any proposals. Broadly, the stage two assessment process should:

- identify the range of likely impacts on the environment
- identify whether these impacts will need to be considered further in later stages of the assessment process

2.5.3 As many AQMAs are located in urban locations and at a relatively small scale, the consideration of other environmental impacts may not necessarily be extensive. It will, however, be beneficial to consider as wide a range of impacts as possible.

2.5.4 Whilst reflecting the early stage of development of any plan, it is recommended that local authorities consider whether there is likely to be any requirement for a statutory assessment under the Environmental Assessment (Scotland) Act 2005 as part of the stage two assessment process. [Guidance on Strategic Environmental Assessment](#) is available online.

2.5.5 Whilst improved air quality will be beneficial for all, the potential for unintended impacts exists. It will be important for local authorities to consider the potential for impacts on equality, to identify issues which will require to be considered through an equalities impact assessment should the introduction of an LEZ be progressed.

2.5.6 The exclusion of certain vehicle classes from an area will have an impact on the overall transport offering. It will be important when considering impacts to ensure options for public transport, active travel and integrated transport are maximised and unintended consequences, such as impacts on equality and connectivity, are taken into account. It will also be important to ensure that other policy measures such as parking, planning and climate change are also considered.

2.5.7 Whilst costs will be dependent upon the scope and design of any LEZ or other transport-related measure being introduced, the stage two assessment work will allow a high-level estimate of costs to be made. The NMF process will support the consideration of costs, by helping to define the boundary and scope of any LEZ, allowing outline costs to be identified as part of the decision-making process.

## 2.6 Assessment outcome

2.6.1 The overall outcome of the stage two assessment process will be to identify whether the introduction of an LEZ should be progressed to support the delivery of improved air quality and, in particular, to reduce any exceedances of air quality standards.

2.6.2 The NMF approach will support this decision by providing evidence to:

- show air quality impacts of potential LEZ options
- help identification of the preferred option
- aid consideration of wider impacts of the preferred option
- help establish the likely costs of the preferred option

2.6.3 Alternatively, the stage two assessment may conclude that the introduction of an LEZ is not the most appropriate measure to improve air quality. In those cases, the information produced through the NMF will support the identification of alternative transport-related measures to reduce exceedances of air quality.

2.6.4 In such cases, the identification of these alternative transport measures should be considered as part of the appraisal process, with the outcomes reported through the stage two Assessment Report.

2.6.5 Any measures identified through the stage two assessment should be included within the AQAP with the date by which they will be delivered.

## **2.7 Reporting requirements**

2.7.1 Local authorities should prepare a report on the outcome of the stage two assessment, documenting the work undertaken and the recommendation on whether an LEZ should be introduced or other identified measures implemented. SEPA will provide the local authorities with an interim report and a detailed NMF report for use in the preparation of the stage two assessment report.

2.7.2 The stage assessment two report will be reviewed and agreed by Scottish Government and SEPA.

## **2.8 Next steps**

2.8.1 Where the outcome of the stage two assessment concludes that an LEZ is required then it is anticipated that this will be introduced by 2023 in line with Scottish Government commitments included within the Programme for Government 2017-18.

## Appendix 1

### Low Emission Zones

#### Overview

1.1 Low Emission Zones set an environmental limit on certain road spaces, allowing access to only the cleanest vehicles and can help to transform towns and cities into cleaner, healthier places to live, work and visit.

1.2 Vehicles that do not meet the emission standards set for a LEZ will not be able to enter the zone. A penalty charge will be payable by the vehicle's registered keeper where a non-compliant vehicle enters unless it is exempt.

1.3 Access to LEZs is usually based on Euro emission engine classification standards (Euro standards) which provide the emission rating of a vehicle including limits for Nitrogen Oxides (NOx) and Particulate Matter (PM).

1.4 LEZs can be a useful option to improve air quality although outcomes are dependent on size, vehicle scope, traffic data robustness and local metrology.

#### Emission standards

1.5 Euro standards define the acceptable limits for exhaust emissions of new vehicles sold in EU and EEA member states. The emission standards are defined in a series of European Union directives staging the progressive introduction of increasingly stringent standards.

1.6 Scottish LEZ restrictions will be based upon Euro standards, with the proposed minimum criteria likely to be:

- Euro 6 for diesel cars
- Euro 4 for petrol cars
- Euro VI for buses and other heavy diesel vehicles (including older vehicles fitted with accredited retrofit technology).

1.7 The current proxy for determining the Euro standard of cars is to use age as a guide to the corresponding Euro classification:

- the Euro 6 standard for diesel cars was introduced in September 2014, with any new car sold after September 2015 having to meet this standard
- the Euro 4 standard for petrol engines was introduced in January 2005, with any new vehicles sold after January 2006 having to meet this standard

1.8 There is currently no reliable approach for basing a scheme on real world emissions performance and, whilst there are likely to be some 'gross polluters' in the

vehicle fleet which are emitting proportionally more than the fleet generally, it is unlikely that these can be addressed through LEZs.

1.9 By prescribing minimum emission standards for each vehicle class, the emission standards applied within LEZs will be consistent across Scotland.

1.10 Vehicles which do not meet the specified emission standard will be subject to a penalty if they enter an LEZ unless they are covered by a specified exemption or meet other criteria such as an agreed retrofit standard or they are a zero or ultra-low emission vehicle.

1.11 In most LEZs, exemptions are available for certain vehicles which mean that they will not be subject to enforcement action if they enter the zone. These are often linked to the type of vehicle and its purpose e.g. emergency service vehicles or historic vehicles (vehicles with a 'historic' vehicle tax class).

### Retrofitting

1.12 In some cases, retrofitting a vehicle can provide an alternative to buying a new vehicle to meet the relevant emission standards. There are a range of retrofitting options for vehicles, which may be particularly important for buses. Retrofitting should be undertaken in accordance with an accredited scheme which can demonstrate that vehicles meet minimum requirements.

1.13 Retrofitted vehicles which meet the requirements of an approved accreditation scheme will be considered to be compliant with the LEZ requirements.

### Phasing

1.14 A grace period is a period during which entering the LEZ will not result in a penalty charge becoming payable. Grace periods can vary between vehicle types, with some vehicles required to comply with the emission standards ahead of others.

1.15 Grace periods can last for different lengths of time depending on the vehicle concerned and are usually between one and four years, running from the date of the scheme coming into effect. Often a longer period is allowed for residents who live within an LEZ.

1.16 In deciding on the appropriate grace period, consideration is given to the change needed in vehicle mix to meet the air quality aims, as well as the social, economic and health impacts of introducing the LEZ.

1.17 It is important that exemptions and grace periods do not undermine the objectives of the LEZ which is focused on improving air quality as soon as possible

### Further information

1.18 Information on Scotland's LEZs can be found on the [Low Emission Zones website](#).

## Appendix 2

### Screening considerations

2.1 The screening approach requires consideration of the existing AQAP measures and the likely effects on local air quality.

2.2 Early engagement across local authority functions to ensure that all appropriate planned actions or programmes of work are identified and included within the screening assessment is key to assessing the overall potential for achieving compliance within the AQMA in the shortest possible time.

2.3 The table below outlines the type of information that should be collated to support the screening exercise.

<b>Collate:</b>	
Details on the air quality action plan that sets out a framework for projects and other activities, either with regard to the location, nature, size and operating condition of the AQMA or by the allocation of resources through other programmes of work.	The air quality action plan must provide a clear framework of measures that are directly related to improving air quality or demonstrate a clear link to other programmes of work that represent actions that will have a positive impact on the AQMA. For example: The local Transport Strategy that sets out a series of actions that will reduce the volume of traffic or the emissions from traffic affecting the AQMA.
Evidence on how the measures in the air quality action plan (and associated programmes of work) will deliver significant progress towards achieving the AQ objective within the shortest possible time.	On its own, the air quality action plan may not provide the measures required to achieve significant improvements. The inclusion of measures associated with other programmes of work undertaken in relation to other functions of the local authority will help toward meeting the air quality objective(s). Consideration of how much any additional measure will contribute towards achieving the AQ objectives is a key criteria in demonstrating the likely overall air quality outcomes of the action plan. For example: City/town plans that will change the street layout in and around the AQMA, which will promote improvements in air quality and reduce potential exposure of the local receptors.
Information on wider policies/strategies and/or planned actions across the local authority that will promote the integration of environmental considerations, in particular air quality improvements.	The early identification of any plans, strategies or planned actions or programmes of work that have the potential to either reduce or restrict improvements to air quality, regardless of potential positive benefits to the community. The aim of early identification is to allow for potential mitigation measures to be established as an integral part of the policy, strategy and/or planned action and to identify

	<p>the potential negative effects on delivering improvements in air quality.</p> <p>For example: Planned transport infrastructure changes that aim to improve traffic flow in a specific location but may restrict future improvements in air quality associated with, or close to, existing or potential AQMAs.</p>
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2.3 In identifying plans or programmes of work across local authority functions, it is important to consider the characteristics of the effects and the area likely to be affected. This will assist in determining the potential impact on achieving compliance within the existing AQMA and help to manage the risk of future AQMAs requiring to be declared.

<b>Assess or quantify</b>	
The probability, duration, frequency and reversibility of the effects	The more widespread and long lasting the effects identified within the action plan or programme of work, the more likely it is that there will be positive improvement in air quality within the AQMA. If the effects are likely to be short-term, not repeated and easily reversible, it is less likely to be deliver a significant improvement for the AQMA. Where the benefits to air quality are not likely to be long lasting, a NLEF stage two assessment could be required as the plan may not deliver the improvements necessary to achieve compliance with the air quality objective(s).
The cumulative nature of the effects	There are likely to be cumulative effects from the action plan and programmes of work and these can be considered terms of synergistic effects, additive impacts and secondary effects. Cumulative effects can arise from the combination of the actions set out within the air quality action plan and/or programmes of work delivered across other functions and can be positive or negative e.g. the benefit of adopting actions set out in a local active travel strategy could be enhanced by proposed changes to traffic management in the same area. Conversely, the air quality benefits of the active travel actions could be negated by developments proposed in the vicinity of a local transport corridor that will increase traffic volumes and congestion levels.
Transboundary nature of the effects	The transboundary nature of the effects comes from actions by one local authority impacting upon another local authority's AQMA. This is also relevant to multiple AQMAs within a single local authority.
The magnitude and spatial extent of the effects (in terms of geographical area, population or reduction in pollution likely to be affected)	This is an important measure for distinguishing between strategic and project-scale actions in terms of air quality improvements. High-level plans and strategies generally cover a large geographical area with the level of specific improvement measures

	<p>included being generally low. For AQMA, direct actions or specific programmes of work will generally results in a greater level of potential improvements through delivery of measures directed towards improving air quality. It is important to distinguish between differences in strategic and project scale measures and to quantify potential improvements as accurately as possible to ensure that compliance is achievable in as short a time as possible. The contributions made by the range of plans, measures and actions set out by the local authority should be considered.</p>
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## Appendix 3

### Acronyms, terms, and definitions

Term	Definition
Air Quality Management Area (AQMA)	Local authorities review and assess air quality in their area on an ongoing basis, measuring air pollution and predicting how it will change over time. The aim is to make sure that the national air quality objectives will be achieved by the relevant deadlines. If a local authority finds any places with relevant exposure where the objectives are not likely to be met, it must declare an Air Quality Management Area there.
Air Quality Objective (AQO)	A set of air quality standards and objectives has been developed for several pollutants of concern for human health. Each objective has a date by when it must be achieved. The objectives adopted in Scotland for the purpose of Local Air Quality Management are set out in the Air Quality (Scotland) Regulations 2000, the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016.
Air Quality Action Plan (AQAP)	Where local authorities have declared an Air Quality Management Area (AQMA), they have a duty to produce an Air Quality Action Plan (AQAP). The AQAP includes a series of measures that the authority intends to introduce in pursuit of the Air Quality Objectives (AQO).
Annual Progress Report (APR)	The Annual Progress Report (APR) provides an update on the monitoring conducted by the local authority (and where appropriate), the actions set out within the AQAP associated with the AQMAs.
European Emission Standards	Define the acceptable limits for exhaust emissions of new vehicles sold in EU and EEA member states. The emission standards are defined in a series of European Union directives staging the progressive introduction of increasingly stringent standards.
Geographic Information Systems (GIS)	GIS visualise, question, analyse, and interpret data spatially to understand relationships, patterns, and trends.
Heavy Goods Vehicle (HGV)	Widely used to describe trucks with a gross combination mass of over 3.5 tonnes.
Light Goods Vehicle (LGV)	Widely used to describe commercial carrier vehicles with a gross vehicle weight of not more than 3.5 tonnes.
Low Emission Zone (LEZ)	A LEZ is a geographically defined area where the most polluting classifications of vehicles are restricted, deterred or discouraged from access and use. The aim is to reduce the number of polluting vehicles being used in a particular area or accelerate the improvement in fleet quality that would otherwise have occurred. This is achieved by setting particular exhaust emission standards as conditions of entry, with the aim of improving the air quality in that area.

National Modelling Framework (NMF)	The NMF provides evidence based approach to deliver the air quality modelling requirements set out in CAFS. The model consists of the regional NMF model to provide air quality information to support decision making on placemaking and transport planning at a regional level. The local NMF model will focus on gathering, analysing and presenting evidence in a consistent manner to support the NLEF appraisal process.
NO <sub>x</sub>	NO <sub>x</sub> is a generic term for the nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO <sub>2</sub> ). NO <sub>x</sub> gases are usually produced from the reaction among nitrogen and oxygen during combustion of fuels, such as hydrocarbons, in air; especially at high temperatures, such as occur in car engines
PM <sub>10</sub>	Particulate matter (PM <sub>10</sub> ) consists of very small liquid and solid particles present in the air. Of greatest concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. These particles are less than 10 microns in diameter - about 1/7th the thickness of a human hair - and are known as PM <sub>10</sub> .
PM <sub>2.5</sub>	PM <sub>2.5</sub> , also called “fine particulates” refers to atmospheric particulate matter (PM) that have a diameter of less than 2.5 microns in diameter, which is about 3% the diameter of a human hair. Commonly referred to as PM <sub>2.5</sub> . Fine particles can have more serious health concerns since smaller particles can travel more deeply into lungs and cause more harmful effects.
Retrofitting	Refers to the addition of new technology or features to older systems. Engine retrofitting involves improving efficiency, increasing output, or reducing emissions although retrofit to the exhaust system is more common.
Road Access Charging	Direct charges levied for the use of roads, including road tolls, distance or time based fees, congestion charges and charges designed to discourage use of certain classes of vehicle, fuel sources or more polluting vehicles.
Vehicle Access Regulation Schemes (VARS)	VARS regulate the types of vehicles which can enter a designated area, usually to improve issues such as congestion or air quality or to increase safety for pedestrians and cyclists or enable priority for public transport.

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