Low Emission Strategy for Scotland

Consultation



January 2015

The Scottish Government
Riaghaltas na h-Alba

Responding to this consultation paper

We are inviting written responses to this consultation paper by 10 April 2015. Please send your response with the completed Respondent Information Form to:

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or

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If you have any queries or require further information about the consultation please contact Andrew Taylor on 0131 244 7813 or at the above email address.

We would be grateful if you could clearly indicate in your response which questions or parts of the consultation paper you are responding to as this will aid our analysis of the responses received.

This consultation, and all other Scottish Government consultation exercises, can be viewed online on the consultation web pages of our website at http://www.scotland.gov.uk/consultations

The Scottish Government has an email alert system for consultations, http://register.scotland.gov.uk This system provides a weekly email containing details of all new consultations (including web links). It complements the Scottish Government distribution lists, and is designed to allow individuals and organisations to keep up to date with all Scottish Government consultation activity, and therefore be alerted at the earliest opportunity to those of most interest.

Handling your response

We need to know how you wish your response to be handled and, in particular, whether you are happy for your response to be made public. Please complete and return the Respondent Information Form, which can be found at the end of this consultation paper, as this will ensure that we treat your response appropriately. If you ask for your response not to be published we will regard it as confidential, and we will treat it accordingly.

All respondents should be aware that the Scottish Government is subject to the provisions of the Freedom of Information (Scotland) Act 2002 and therefore has to consider any request made to it under the Act for information relating to responses made to this consultation exercise.

Next steps in the process

Where respondents have given permission for their response to be made public and after we have checked that it contains no potentially defamatory material, responses will be made available to the public in the Scottish Government Library at Saughton House, K Spur, Saughton House, Broomhouse Drive, Edinburgh, EH11 3XD, (telephone 0131 244 4565) and on the Scottish Government consultation web pages within six weeks of the consultation closing date. You can make arrangements to view responses by contacting the Library on 0131 244 4552. Responses can be copied and sent to you, but a charge may be made for this service.

What happens next ?

Following the closing date, all responses will be analysed and considered along with all other available evidence to help us reach a decision on how to finalise the Low Emission Strategy. We aim to issue a report on this consultation process within four weeks of the closing date and introduce any necessary legislation as soon as possible.

Comments and complaints

If you have any comments about how this consultation exercise has been conducted, please use the contact details on the previous page.

Purpose of consultation

The purpose of this consultation is to seek views on the draft national Low Emission Strategy for Scotland, which has been produced by the Scottish Government, Transport Scotland and the Scottish Environment Protection Agency (SEPA), with input from a wide range of other organisations in the public and private sectors.

Background

Low Emission Zones (LEZs) are a potentially effective measure that could help to improve local air quality. Although adopted widely in other parts of Europe and in a handful of locations in England (notably London), no Scottish local authority has to date introduced an LEZ. Reasons for this include costs, perceived economic impact and political/public acceptability. Feedback from local authorities and others does suggest however that a national framework could encourage LEZ adoption. Currently, local authorities are able to establish LEZs in their areas and set their own emissions standards and operating procedures. Whilst this gives flexibility to create specific solutions for local issues, it means businesses potentially having to comply with a different set of conditions each time their vehicles enter a different LEZ, which would have both economic and practical negative impacts. A national framework – initial proposals for which are set out in section 8 of the draft Low Emission Strategy - would involve the setting of emissions standards and procedures which would be applicable across Scotland, providing certainty and consistency for all who would be affected.

We announced in July 2013 plans to develop a national LEZ framework. Subsequent discussions with a range of organisations and individuals involved in air quality management suggest that greater benefit could be obtained from a wider Low Emission Strategy (LES), within which the LEZ framework would sit. Over the last few months, a draft LES has been produced which we are now seeking detailed comments on.

The LES draws together the various policies being implemented and developed across a range of central government portfolios which have the potential to improve air quality, and presents these within a coherent overall framework. Although there is currently a great deal of activity involving the Scottish Government, Transport Scotland, SEPA, Health Protection Scotland and others in relation to air quality, it is not always obvious, particularly to those outwith these organisations, how these initiatives relate to each other. Key aims of the LES are to help address this, and also to contribute to more effective and efficient policy delivery.

Earlier in 2014, we held a series of consultation workshops to help inform development of the draft LES. Representatives from around 50 organisations in both the public and private sectors attended these workshop and the output from them is described in detail in annex A of the draft LES. Following this second stage consultation, we plan to publish the final version of the LES in the first part of 2015.

Consultation questions

Specific questions on which the Scottish Government is seeking views are listed below and are summarised on the Respondent Information Form at the end. To aid our analysis it would be helpful if responses could be structured around these questions. However we welcome contributions on any aspect of the draft LES and consultees are free to provide additional comments, suggestions and information which they feel are not covered by this format.

Q1 Do you think the Mission, Vision and Objectives for the Low Emission Strategy are appropriate? If not, what changes would you suggest?

Q2 Do you think the proposed actions will deliver the Mission, Vision and Objectives? If not, what changes to the actions would you suggest? Are additional actions required? If so, please suggest what these might be.

Q3 Does the Setting the Scene section accurately summarise the current policy situation? Please suggest changes if not.

Q4 Does the Way Forward section give a reasonable outline of what further action is needed to deliver an effective Low Emission Strategy? Please suggest changes if not.

Q5 What are your views on the proposals for the National Modelling Framework?

Q6 What are your views on the proposals for the National Low Emission Zone Framework?

Q7 What are your views on the proposed Key Performance Indicators? Are any different or additional Indicators required?

Contents

1 Ministerial Foreword

Clean air is essential for our health and wellbeing, and for protecting the environment. Whilst we have made great strides over recent years in tackling air pollution in Scotland, it must be acknowledged that pockets of poorer air quality remain in many of our towns and cities. The impacts of this are not distributed evenly across the population, and it is the more vulnerable members of society – the elderly, the very young and those with cardiovascular and respiratory conditions – who bear the largest burden.

People rightly expect to be able to breathe clean air and the Scottish Government is determined to ensure that we continue to make progress in tackling this hugely important issue. However, although we can take the lead and set an example through our own actions, we cannot achieve this alone. Successfully addressing air pollution requires a partnership approach, involving the Government, its agencies, local authorities, business and industry, Non Government Organisations and indeed the general public.

The purpose of this Low Emission Strategy is to provide a framework within which all of us can work together towards the common aim of the best possible air quality for Scotland. We already enjoy an enviable reputation for our landscape and scenery, and we want to be in the position where our air quality is viewed in the same way.

Lower concentrations of air pollution do not just have a positive impact on human health and the environment. Many of the measures which we can implement – such as greater use of public transport, green infrastructure, cycling and walking – will make our urban areas more pleasant spaces to move around and spend time in. They will also reduce congestion and improve traffic flow, delivering practical and financial benefits for business.

All of us, both through our personal and professional lives, can help to make a real difference to the quality of the air that we breathe. With a concerted effort to work together towards this goal, the vision of our Low Emission Strategy can be realised.

Aileen McLeod MSP
Minister for Environment,
Climate Change and Land Reform

Derek Mackay MSP
Minister for Transport and Islands

2 Executive Summary

The purpose of this Low Emission Strategy (LES), as stated in **Section 3**, is to draw together the various policies being implemented and developed across a range of central and local government portfolios which have the potential to improve air quality, and present these within a coherent overall framework, setting a new refocused agenda for action. The Strategy sets out the contribution that better air quality can make to sustainable economic growth and quality of life for the citizens of Scotland.

Section 4 sets out the mission, vision and objectives of the Strategy. It also summarises the key actions which the Strategy aims to deliver, across the policy areas of health, transport, climate change, land use planning and energy, with a common thread of communications and collaboration running through these. Finally this section describes the leadership and governance of the Strategy, outlining the procedure for monitoring and reporting on implementation.

Section 5 provides a summary of air quality today and explains why additional action is required to reduce levels of air pollution further. It also describes the relationships between air quality and environmental noise, human health, climate change, transport, land use planning, the natural environment and energy use.

Section 6 sets out the further actions that will be delivered in relation to the policy areas covered in Section 5.

Section 7 outlines the proposed National Modelling Framework which is intended to provide a standard air quality assessment methodology for use across Scotland.

Section 8 introduces the National Low Emission Zone Framework. This sets out a procedure for local authorities to determine whether a Low Emission Zone would be an effective measure for addressing air quality issues in their areas. **Annex B** provides more detail on the Framework, including the national standards which will be applied to any local Low Emission Zone.

Section 9 lists the Key Performance Indicators which will be used by local authorities to report progress on their role in implementing the Strategy.

Annex A describes the consultation process which informed the development of the Strategy. Annex C provides further guidance on air quality modelling, Annex D lists some useful resources and Annex E gives some general background and links to further information on air quality legislation and policy.

3 Introduction

Air quality can be defined as a measure of the condition of air relative to the requirements of the environment or to any human need or purpose. Our air is cleaner in overall terms than at any time since the Industrial Revolution and its quality has improved considerably over recent decades. As a society we don't have the dangerously poor air quality that previous generations had to put up with. We don't habitually see factory chimneys and houses belching out black smoke. We don't see these issues because successive governments have legislated to introduce tighter controls on emissions of pollutants from industry, transport and domestic sources.

However, air pollution still harms human health and the environment. In the UK, health impacts of poor air quality have been calculated to cost between £9 and £19 billion per year, with transport contributing around half of this total[1]. So, although we have made great strides over recent years, there are significant benefits to be gained from further improvements.

The purpose of this Low Emission Strategy (LES) is to build on these achievements and draw together the various policies being implemented and developed across a range of central and local government portfolios which have the potential to improve air quality, and present these within a coherent overall framework. The LES sets out the contribution that better air quality can make to sustainable economic growth and quality of life for the citizens of Scotland. Delivering sustainable economic growth for Scotland does not have to come at the expense of good air quality.

A strong partnership approach has informed the development of the LES. A series of consultation workshops, described in Annex A, provided the opportunity for a wide range of organisations and individuals to contribute their views. The Scottish Transport Emissions Partnership[2], the Scottish Urban Air Quality Group and other partners have also been closely involved.

[1] http://archive.defra.gov.uk/environment/quality/air/airquality/panels/igcb/documents/100303-aq-valuing-impacts.pdf
[2] http://www.stepscotland.com

4 Structure

4.1 Mission, Vision and Objectives

Mission:

To protect and enhance health, wellbeing, environment, place-making and sustainable economic growth through improved air quality across Scotland.

Vision:

Scotland's air quality is amongst the best in Europe.

Objectives:

Communication:
A Scotland where all are well informed, engaged, and empowered to manage our air quality.

Health:
A Scotland which protects its citizens from the harmful effects of poor air quality.

Transport:
A Scotland that reduces transport emissions through supporting the uptake of low emission fuels and technologies and promoting modal shift away from the car.

Development:
A Scotland where the implications for air quality form part of decision making on new development.

Climate Change:
A Scotland that reduces greenhouse gas emissions whilst delivering co-benefits for air quality.

Energy:
A Scotland that achieves its renewable energy targets without compromising air quality.

Obj	#	Actions	Lead	Date
Collaboration	**1 Provide peer reviewed and consistent evidence on air quality issues**			
	1a	The LES will support the ongoing Greener Scotland communication campaigns, encouraging individuals to use the car less to improve their health and their local environment.	SG/TS	2017
	1b	The Daily Air Quality Index will be adopted as the key air quality indicator.	SG	2015
	2 Develop fuller public, private, business, and academic engagement on air quality management			
	2a	A revised Local Air Quality Management system will be introduced.	SG	2015
	2b	Assess case for adopting World Health Organisation guideline values for PM_{10} and $PM_{2.5}$ as Scottish objectives.	SG	2015
	2c	$PM_{2.5}$ will be included in regulations for Local Air Quality Management.	SG	2015
	2d	A $PM_{2.5}$ monitoring network will be established.	SG	2017
	3 Establish a national Low Emission Zone Framework			
	3a	A national air quality modelling methodology will be developed.	SEPA	2015
	3b	A screening procedure for assessing LEZ requirements will be produced.	SG/ SEPA	2015
	3c	A national LEZ Framework will be developed.	SG/ SEPA	2015
	4 Air quality and noise			
	4a	Options for updating information on conflicts and synergies between air quality and noise will be considered.	SG	2015
Health	**5 Compliance with air quality legislation**			
	5a	On a prioritised basis, a 100% declassification of Local Air Quality Management Areas will be targeted.	SG	2020
	5b	Full compliance with the EU ambient air quality Directive will be achieved.	SG	2020
	5c	Compliance with the UK exposure reduction targets for $PM_{2.5}$ will be achieved.	SG	2020
	6 Provide consistent national air quality health messages			
	6a	A DPSEEA analysis of air quality and heath will be conducted.	HPS	2015
	6b	A communications strategy will be developed to convey health impacts of poor air quality.	HPS	2015
	6c	Health Board areas with AQMAs should ensure that the next revision of the Joint Health Protection Plan includes objectives relating to air quality and associated air quality action plans.	HBs	2017
	7 Provide further evidence of the impact of air quality on health			
	7a	Regular scientific evaluations of the impact of the Low Emission Strategy on health will be undertaken.	HPS	2017
Transport	**8 Measurement and modelling of roadside transport emissions**			
	8a	Trialling of low-cost sensor technology that would enable roadside monitoring of air quality, in order to underpin urban traffic modelling, will take place.	TS/SG	2018
	9 Intelligent traffic system management			
	9a	Local authorities will review traffic management procedures and ensure that traffic flow is optimised.	LAs/TS	2017
	9b	Options for local authorities to use resident and visitor policies to encourage low emission vehicles will be explored.	SG/LAs	2017
	10 Active travel			
	10a	Paths for All will establish a new delivery forum for the National Walking Strategy, and will work in partnership with the Cycling Action Plan for Scotland Delivery Forum.	SG	2017
	10b	Work collaboratively with our delivery partners towards our shared vision that by 2020 10% of everyday journeys will be made by bike.	SG/LAs	2020

Obj	#	Actions	Lead	Date
	10c	All local transport strategies will include policies to deliver a modal shift away from private vehicle use.	LAs	2018
	11 Public transport			
	11a	Work with operators and local authorities to review and improve the Green Bus Fund scheme, taking account of technological and market developments.	TS/SG	2018
	11b	Evaluate Bus Investment Fund supported projects and generate good practice examples to inform future national, regional and local initiatives.	TS/SG	2018
	11c	Consider how statutory quality partnerships could be made more effective.	TS	2017
	12 Low Emission Vehicles			
	12a	The Low Emission Strategy will support delivery of the actions contained in Switched On Scotland: A Roadmap to Widespread Adoption of Plug-In Vehicles.	TS	2015
	12b	Work with key partners to investigate the use of hydrogen as a transport fuel, as well as exploring wider environmental and economic opportunities of using hydrogen for energy applications – especially in promoting renewables, energy balancing and storage.	TS / SG	2015
	13 Freight			
	13a	Continue to support and develop the ECO Stars programme in Scotland.	SG	2018
	13b	Guidance on establishing Freight Quality Partnerships will be reviewed and revised where necessary.	TS	2015
***Development**	**14 Contribution of development and plans to air quality improvements**			
	14a	Local authorities are required to take account of the objectives and policies in the Low Emission Strategy in preparation of Development Plans and when undertaking Development Management.	LAs	2016
	14b	The objectives and policies in the Low Emission Strategy should be considered as part of the Community Partnership Planning process.	LAs	2016
	14c	Local authorities with air quality issues to review supplementary guidance and revise at the next scheduled update (i) to take account of action to improve, air quality whilst (ii) aligning with Low Emission Strategy objectives.	LAs	2016
	14d	Scottish Planning Policy expects planning authorities to appraise the impact of development plans on the transport network.	LAs	2015
	14e	RTPI to collaborate with the Strategic Development Planning Authorities and the Scottish Government in the development of regional supplementary guidance on air pollution mitigation.	RTPI/ SG/ SDPAs	2016
	14f	Planning authorities should ensure that where potential air quality effects are identified as significant during the SEA process, the issues are considered in the preparation of development plans.	LAs	2016
	14g	All local authorities with AQMAs should ensure that their air quality action plans provide clear advice on air quality assessment and mitigation.	LAs	2016
	14h	In developments where travel plans are required, developers should ensure that potential air quality impacts are addressed. A procedure for monitoring plan implementation should also be put in place and reported upon.	LAs	2016
	14i	All local authorities should ensure that they have a corporate travel plan which is consistent with any local air quality action plan.	LAs	2016
	14j	Strategic Development Planning authorities and local authorities to consider whether a central low emission fund would be appropriate for their circumstances; if so, a feasibility study should be commissioned to inform development of such a fund.	LAs	2016

Obj	#	Actions	Lead	Date
	14k	Planning authorities should use the national modelling methodology as a first step in assessing the potential impact of a development, building in local and development specific monitoring and modelling data as appropriate.	LAs	2016
	14l	Where mitigation measures are required for a development in order to manage air quality effects of development, in accordance with current Scottish Government guidance on planning and air quality, these could be applied through conditions on a planning permission. The use of planning obligations may be appropriate in some circumstances.	LAs	2016
Climate Change	**15 Effective co-ordination of climate change and air quality policies to deliver co-benefits**			
	15a	The Scottish Government and local authorities will endeavour to ensure that policies designed to control greenhouse gas and/or air pollutant emissions are not in conflict with each other (for national plans and local air quality action plans respectively), and are integrated to maximise co-benefits.	SG/LAs	2018
Energy	**16 Delivery of renewable energy targets without compromising air quality**			
	16a	Local authorities are expected to ensure that the national policy position on air quality is taken into account when considering bioenergy applications in their areas and when developing local policies.	LAs	2015
Environment	**17 Protection of the natural environment from the effects of poor air quality**			
	17a	To continually promote the reduction of total emissions to ensure protection of the natural environment.	SEPA/ SG	2015

Table 1 – Actions proposed in the Low Emission Strategy

* Actions that related to specific policy areas are grouped together. Under Planning, this grouping is not intended to suggest that all the actions are the responsibility of planning authorities.

Actions glossary

DPSEEA	A framework created by the World Health Organisation for developing environmental health indicators
HBs	Health Boards
HPS	Health Protection Scotland
LAs	Local authorities
RTPI	Royal Town Planning Institute
SDPAs	Strategic Development Planning authorities
SEPA	Scottish Environment Protection Agency
SG	Scottish Government
TS	Transport Scotland

4.2 Leadership & Governance

The Scottish Government is committed to collaborating with its agencies, Regional Transport Partnerships, local authorities (transport, urban and land use planners and environmental health), developers, employers, businesses and citizens to both tackle poor air quality where it is an issue and to take action that will improve air quality.

The actions cover areas which can be most influenced by the Scottish Government in partnership with others from across the public and private sectors. Local authorities in particular have a key role to play, with the Scottish Government providing support, advice and policy direction. What is absolutely clear is that positive action on air quality will only be realised through strong national and local political leadership and cross-political support.

As show in Figure 1, governance for, and monitoring of, the LES will be the responsibility of the LES Partnership Group which will meet periodically throughout the year with updates provided to the Scottish Urban Air Quality steering group and to the Scottish Transport Emissions Partnership. Both of these groups will be encouraged to contribute their views. An annual LES progress report will be produced by the Scottish Government. We will utilise key performance indicators (see section 9) to measure progress against the LES actions.

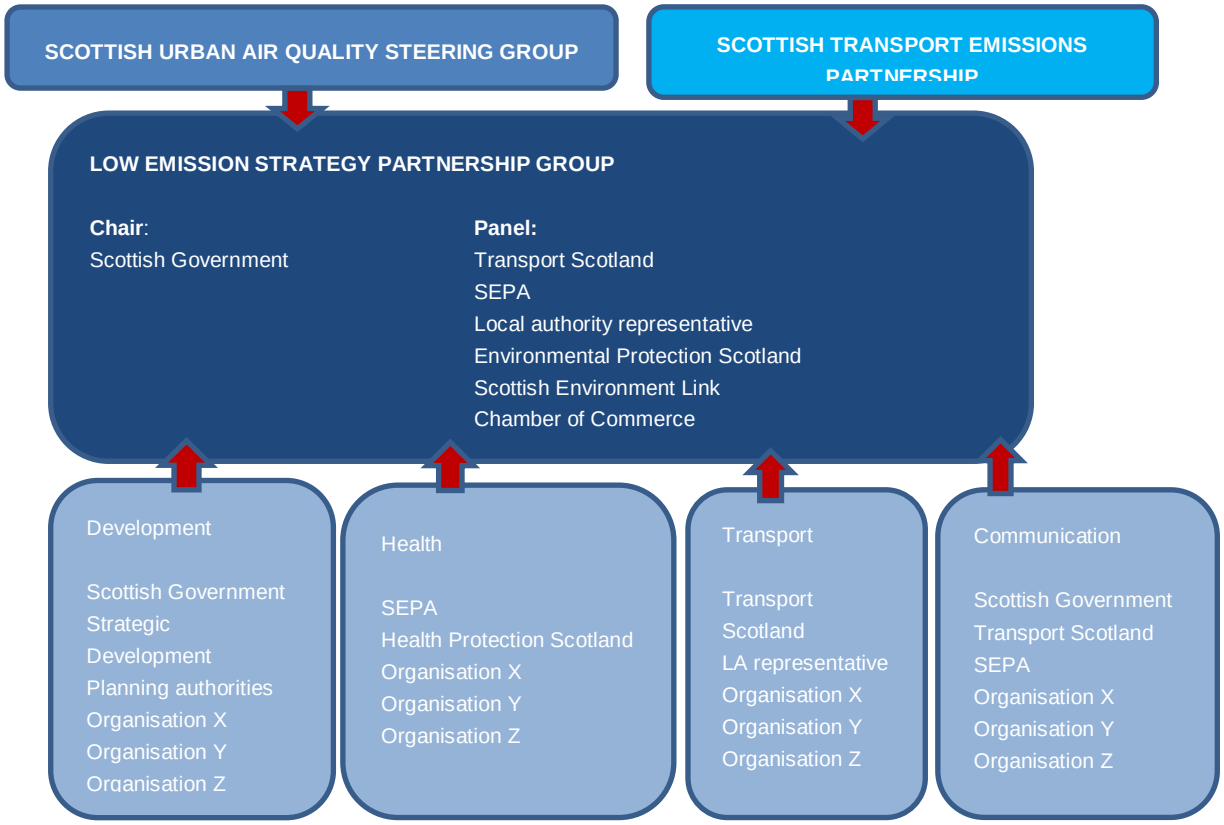


Figure 1 – Governance arrangement for the Low Emission Strategy

5 Setting the Scene

5.1 Air Quality Today

What is air pollution?

Air quality is affected by everything we do. Industry, transport and power generation can all release pollution into the atmosphere (see Figure 2). Even domestic activities such as driving, heating and cooking contribute, as do natural sources like sea salt, wildfires, volcanic activity, soil erosion and farming.

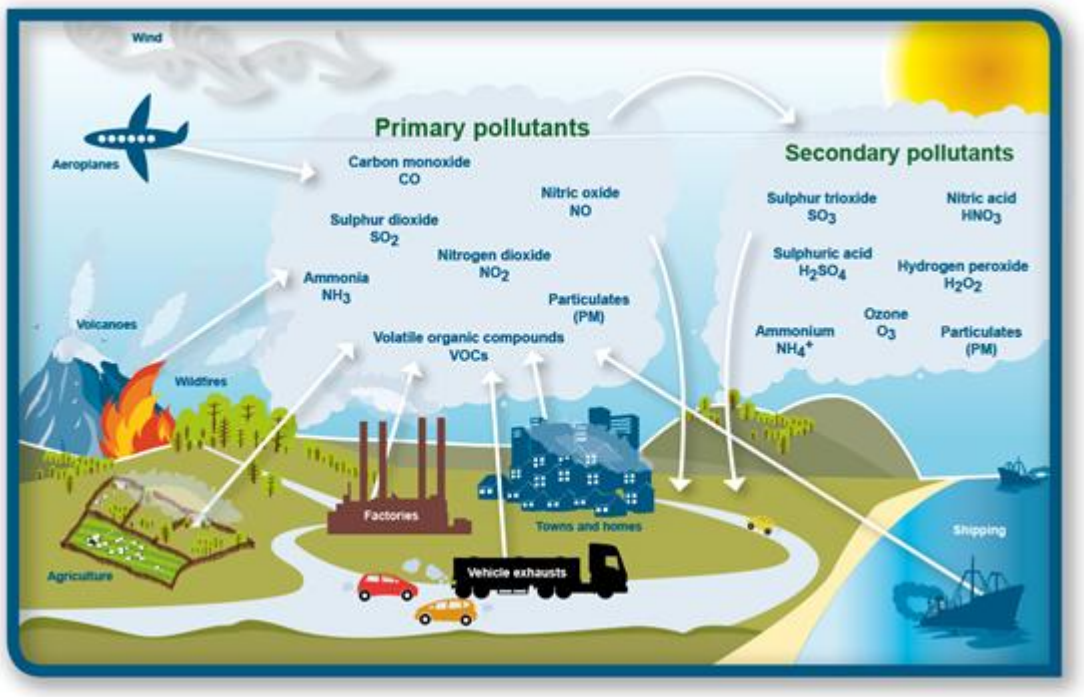


Figure 2 – Sources of air pollution[3]

The main pollutants of concern in Scotland are:

- Oxides of nitrogen (NO_x);
- Particulate matter (PM_{10} and $PM_{2.5}$);
- Sulphur dioxide (SO_2);
- Non-methane volatile organic compounds (NMVOCs);
- Ground-level ozone (O_3); and
- Ammonia (NH_3).

More detailed information on pollutants and their effects can be found in Annex D.

Why is air pollution still a problem?

We have achieved progressively cleaner air since the 1950s through increasingly strict control of industrial emissions, tighter fuel and emissions standards for road

[3] http://www.environment.scotland.gov.uk/get-informed/air/air-quality/

vehicles and control of smoke from domestic premises. Between 1990 and 2012 we have seen a 59% reduction in particulates, a 65% decrease in oxides of nitrogen oxides and a 79% decrease in sulphur dioxide. Air quality in Scotland compares favourably with the rest of the UK and other EU Member States, but there is work still to do.

Today, air pollution in our towns and cities is overwhelmingly associated with transport emissions, as shown in Table 2. All road vehicle types contribute to air pollution to some degree, while emissions from rail and shipping also provide significant contributions in some locations. The effect is not confined to the big cities but is seen throughout urban Scotland, to the extent that we currently have over 30 Air Quality Management Areas (AQMAs). Potential local authority actions to tackle these issues are outlined in Annex D.

Overall Rank	Sector	NH_3	CO	NO_X	NMVOC	PM_{10}	SO_2	Pb
1	Commercial, domestic and agricultural combustion	1.05%	38.98%	11.78%	3.81%	36.94%	13.63%	24.63%
2	Transport Sources	2.09%	30.11%	37.79%	2.53%	19.59%	2.18%	5.42%
3	Energy Industries	0.00%	5.72%	33.25%	0.00%	9.16%	74.74%	33.35%
4	Industrial Processes	0.22%	2.81%	0.02%	44.42%	9.74%	1.16%	9.34%
5	Industrial Combustion	0.00%	20.23%	14.51%	1.14%	6.90%	7.35%	24.14%
6	Agriculture	86.51%	0.00%	0.00%	7.11%	10.77%	0.00%	0.00%
7	Other	5.51%	1.75%	2.65%	0.49%	3.96%	0.74%	3.12%
8	Fugitive	0.00%	0.42%	0.00%	16.73%	0.97%	0.20%	0.00%
8	Solvent Processes	0.00%	0.00%	0.00%	19.82%	1.96%	0.00%	0.00%
10	Waste	4.62%	0.00%	0.00%	3.96%	0.00%	0.00%	0.00%
	Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 2 – Summary of key pollutant emissions by sector in Scotland in 2012

Further information on emissions can be found in 'Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2012'[4]. Although there has been a strong overall downward trend in emissions since 1990, the picture for concentrations is less clear (as shown in Figure 3). Year to year variations in concentrations can be strongly influenced by meteorological conditions and local factors such as building works and road closures, whilst street design and local transport mix can strongly influence concentrations at street level.

[4] http://uk-air.defra.gov.uk/assets/documents/reports/cat07/1410200846_DA_AQPI_1990-2012_Report_Issue2.pdf

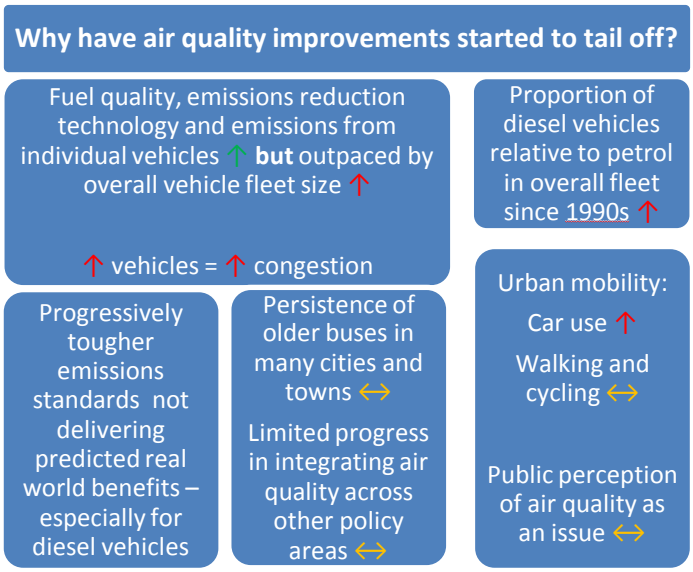


Figure 3 – Air Quality improvements

What needs to be done?

There are no easy solutions but there is an increasing recognition that whilst existing efforts are making a vital and important contribution to improved air quality, more can be done. Policy decisions related to areas such as climate change, transport and planning can have a great influence over air quality. To further improve air quality we need to further strengthen policy linkages, especially in relation to decision-making processes. There is also scope to improve legislation and guidance to provide local authorities with the means and mechanism to improve air quality in their areas.

The LES aims to bring together existing and new measures across a range of policy and technical fields at national, regional and local levels to fulfil the vision for Scotland's air quality to be amongst the best in Europe.

Legislative and policy framework: Europe, UK and Scotland

Air quality legislation and policy is implemented at domestic and European levels, as outlined in Figure 4. Although air quality is a devolved matter under the Scotland Act 1998, much work is still done jointly with the other UK administrations. Many of the issues we face are shared, so it is efficient to pool resources and experience. Further information on, and links to, policy and legislation are in Annex E.

Figure 4 – Air Quality legislation at European, UK and Scottish levels

Air Quality and Noise

There are obvious synergies between environmental noise and air quality, not least because the sources are often the same, most notably road traffic. The areas of concern can also coincide. The largest impact of environmental noise is on annoyance and sleep disturbance, to which more than 30% of the EU population may be exposed. The external costs of noise in the EU amount to at least 0.35% of its GDP; the environmental and health impacts are considered to be just behind those of air quality[5]. Further information on environmental noise legislation and policy can be found on the Scottish Noise Mapping website.

Policies that can have a positive impact on both air quality and noise include improving local traffic flows, managing HGVs in urban areas, speed reductions on motorways and increased separation or buffer zones between sources and sensitive receptors.

5.2 Health Today

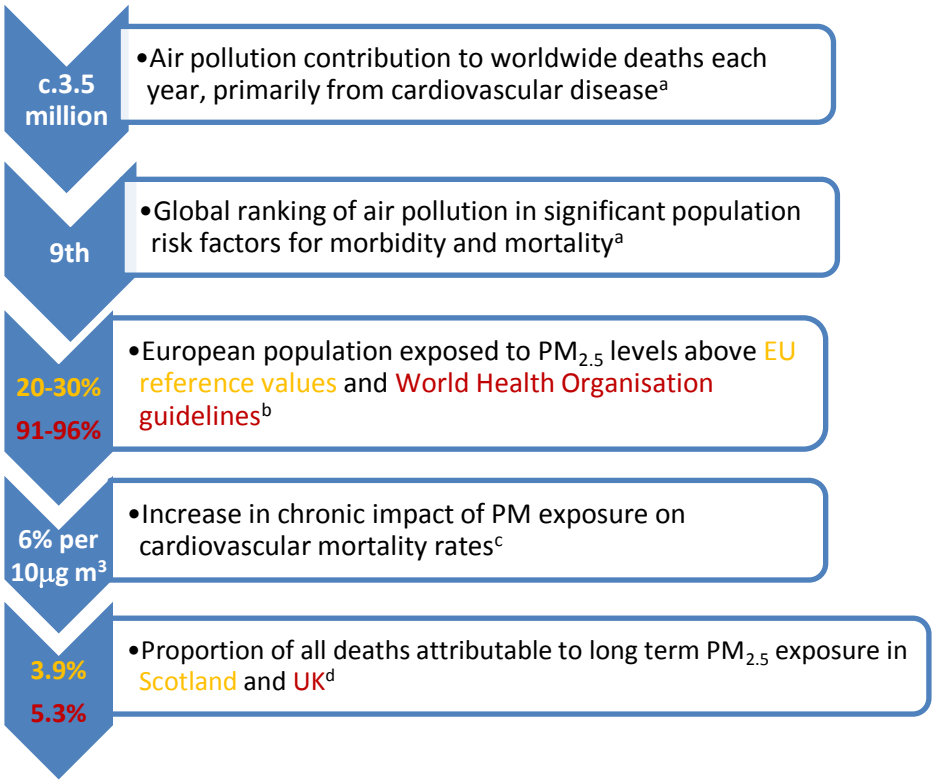
The benefits of good air quality to health and wellbeing are now well established by an increasingly large body of scientific evidence[6]. There is a strong association between exposure to particulate air pollution and cardiovascular and respiratory diseases, especially in urban areas. While the majority of us do not usually suffer from any ill effects in the short-term, continual exposure to air pollution can cause harm over the long-term. However, sensitive individuals such as the young, elderly or people with pre-existing health conditions (e.g. heart disease, lung conditions and

[5] http://ec.europa.eu/environment/noise/
[6] https://www.gov.uk/government/publications/comeap-long-term-exposure-to-air-pollution-effect-on-mortality

asthma) may be adversely affected by day-to-day changes in air pollution levels. Information on the health impacts of primary pollutants is shown in Annex D with background information outlined in Figure 5.

The WHO International Agency for Research on Cancer (IARC) has concluded that diesel engine exhaust[7] particulate matter is a major component of outdoor pollution can be classified as carcinogenic to humans. Also identified was an increasing risk of lung cancer with increasing level of exposure to particular matter (PM)[8]. During the 2013 European Year of Air, the WHO reviewed the most recent evidence on the chronic (long term) impacts of air pollution and found overwhelming evidence of the impact on mortality and morbidity, including cardiovascular and respiratory disease, birth outcomes and neurological effects[9].

Further background on the relationships between air quality and human health can be found in the Health Protection Scotland report 'Air Quality ($PM_{2.5}$ particulate air pollution) and Mortality in Scotland'.[10] The Scottish Government's Good Places Better Health initiative also has an important role to play in ensuring that the links between air quality and health are strengthened[11].



a http://ghdx.healthdata.org/record/global-burden-disease-study-2010-gbd-2010-ambient-air-pollution-risk-model-1990-2010

b http://www.eea.europa.eu/publications/air-quality-in-europe-2013

c https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304641/COMEAP_mortality_effects_of_long_term_exposure.pdf

d https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution

Figure 5 – Air Quality links to health.

7 http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf
8 http://www.iarc.fr/en/media-centre/pr/2013/pdfs/pr221_E.pdf
9 http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf?ua=1
10 http://www.documents.hps.scot.nhs.uk/environmental/briefing-notes/air-quality-and-mortality-2014-04.pdf
11 http://www.scotland.gov.uk/Topics/Health/Healthy-Living/Good-Places-Better-Health

5.3 Transport Today

Transport Scotland is the Scottish Government's national transport agency. National transport projects and policies in Scotland are governed by the National Transport Strategy, where a strategic outcome is to 'reduce emissions, to tackle the issues of climate change, air quality and health improvement which impact on our high level objective for protecting the environment and improving health.' At a local level, Regional Transport Partnerships (RTPs) bring together local authorities and others under regional transport strategies that influence when and how projects and proposals are to be delivered. Local Transport Strategies also have an important role to play.

Transport statistics from the Scottish Household Survey 2013 and the Scottish Transport Statistics provide an insight into travel demand and mode use. Since 2008 there have been minor falls in car traffic and bus passengers whilst rail passenger and distances cycled have risen. Reasons for journeys are relatively constant, with commuting for work, shopping and leisure. Figures 6 and 7 provide a summary of the key Scottish transport statistics.

Transport generates around a quarter of Scotland's total PM_{10} and close to half of the total NO_x emissions, with the majority of emissions being caused by road transport. Journey numbers and distances are increasing (as shown in Figure 6), with car travel equating to 50% of total journeys by distance. With respect to CO_2 emissions, in 2011, emissions from cars and heavy/light goods vehicles accounted for approximately 71% of the 25% from transport within the net greenhouse gas emissions allocation to Scotland.

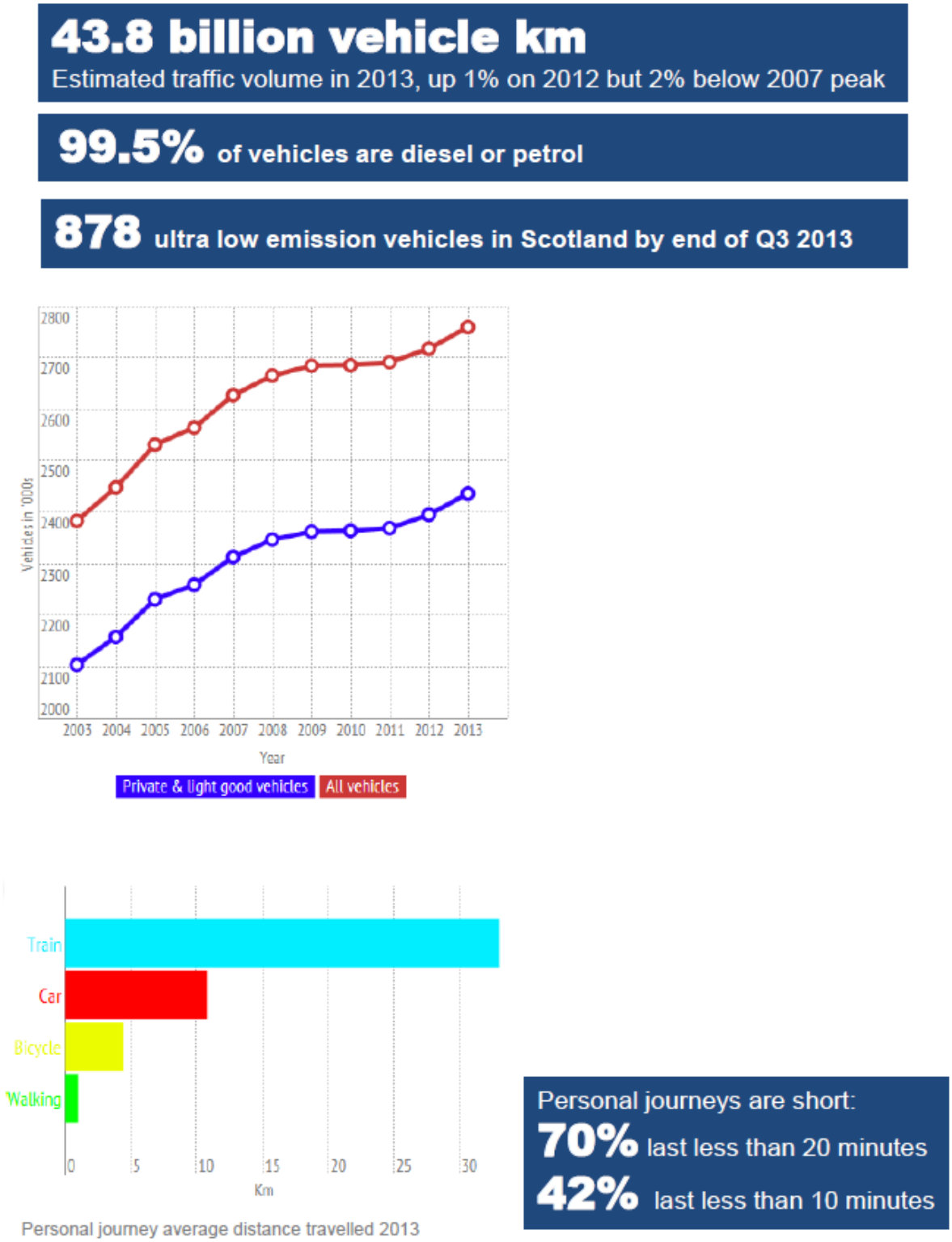


Figure 6 – Transport statistics between 2003 and 2013[12]

[12] http://www.transportscotland.gov.uk/statistics/transport-and-travel-scotland-2013-6008 (published August 2014)
http://www.transportscotland.gov.uk/statistics/j285663-00.htm (published February 2014)
http://www.transportscotland.gov.uk/report/concessionary-travel-customer-feedback-research-year-two-report-6093 (published August 2014)

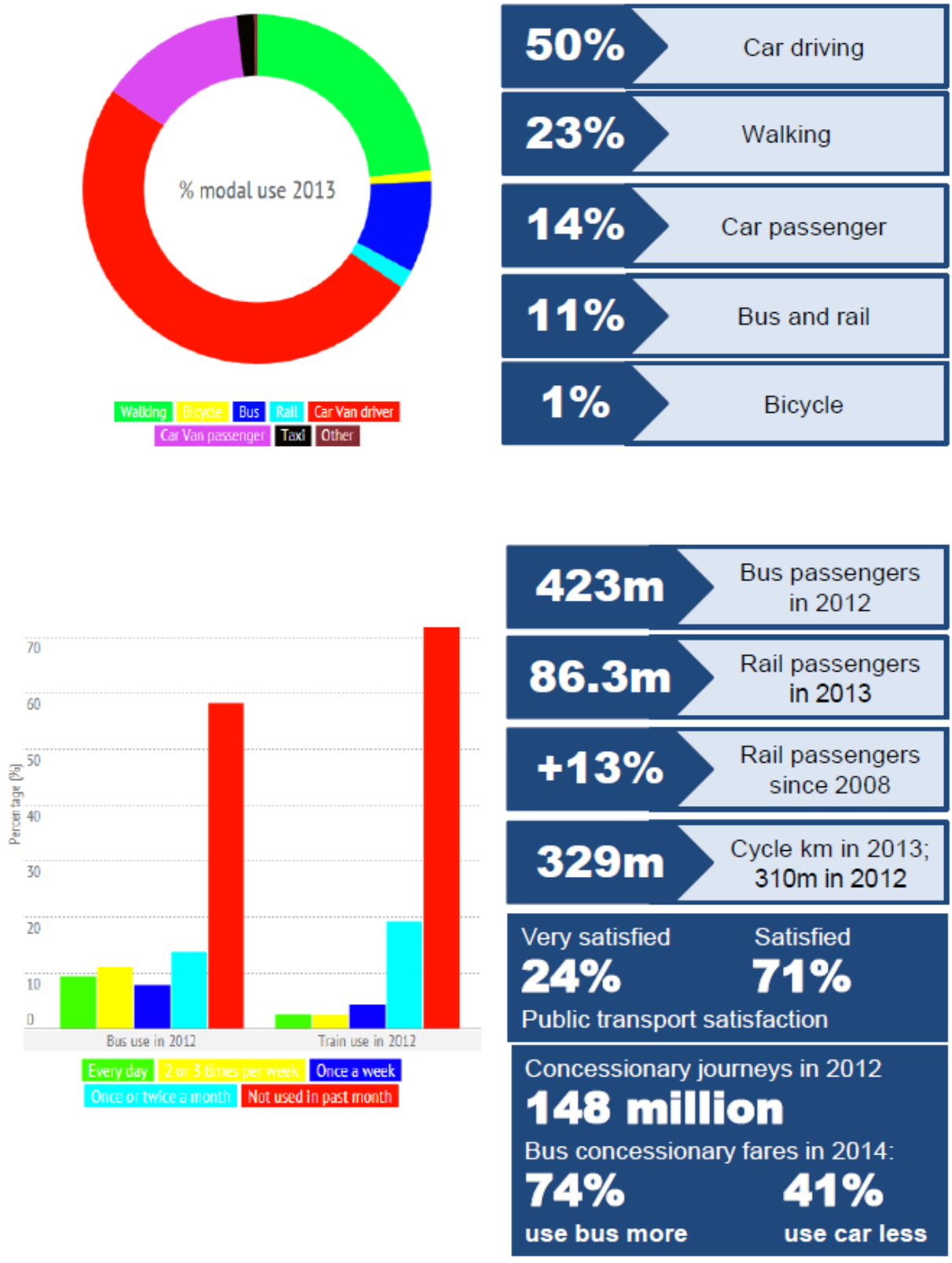


Figure 7 – Transport modal use in 2012 and 2013

5.4 Development Today

Development can have an impact on emissions of both air pollutants and greenhouse gases. Thus, integration of air quality considerations into the planning process at the earliest possible stage, in planning policy and with respect to specific developments, can secure incremental benefits over time.

Scottish Planning Policy (SPP)[13] sets out the Scottish Government's national planning policies. Within the SPP there is a presumption in favour of development that contributes to sustainable development. The SPP includes four key planning outcomes, all of which are directly relevant to this Strategy:

- A successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well designed, sustainable places;
- A low carbon place – reducing our carbon emissions and adapting to climate change;
- A natural, resilient place – helping to protect and enhance our natural and cultural heritage, and facilitating their sustainable use; and
- A more connected place – supporting better transport and digital connectivity.

The SPP also confirms that the planning system **should** support patterns of development which:

- Optimise the use of existing infrastructure;
- Reduce the need to travel;
- Provide safe and convenient opportunities for walking and cycling, for both active travel and recreation, and facilitate travel by public transport;
- Enable the integration of transport modes; and
- Facilitate freight movement by rail and/or water.

Additionally, the SPP says that planning permission **should not** be granted for significant travel generating uses at locations which would increase reliance on the car and where

- direct links to local facilities via walking and cycling networks are not, or cannot be made, available
- access to local facilities via public transport networks would involve walking more than 400m; or
- the transport assessment does not identify satisfactory ways of meeting sustainable transport requirements.

Embedding these principles in strategic and local development plans will help to ensure that sustainable economic development can take place at the same time as emissions of air pollutants and greenhouse gases from transport to and from new developments are reduced.

Town centre strategies should identify how green infrastructure can enhance air quality. Reducing the impact of vehicles on city and town centres will make a significant contribution to realising their potential as sustainable places to live and invest by addressing congestion, air pollution and noise and improving the public

[13] http://www.scotland.gov.uk/Publications/2014/06/5823

realm. Significant health benefits could be achieved by substantially increasing active travel within our most densely populated areas.

Air quality and land use planning guidance[14] confirms that air quality is capable of being a material planning consideration, especially when:

- The proposed development is inside or adjacent to an AQMA;
- The development could result in designation of a new AQMA; and
- The granting of planning permission would conflict with, or render unworkable, elements of a local authority's air quality action plan.

This does not mean that all planning applications should automatically be refused if the development is likely to affect local air quality. These applications should continue to be considered on the basis of all available information.

Further information and guidance on air quality and planning can be found in the Scottish Government's Planning Advice Note 51: Planning, Environmental Protection and Regulation[15], the letter from the Chief Planner to Heads of Planning[16] and the Local Air Quality Management policy guidance[17].

5.5 Climate Change Today

Mitigating the effects of climate change is perhaps the most significant environmental challenge facing society today. However, air pollution and climate change are inextricably linked and influence each other through complex interactions in the atmosphere. Air pollution often originates from the same activities that contribute to climate change, so it makes sense to consider how the linkages between air quality and climate change policy areas can be managed to best effect. In 2010, the four UK administrations published 'Air Pollution: Action in a Changing Climate'[18], which considers these issues in detail.

Historically, air quality and climate change policies have evolved independently from one another. However, it is now agreed that natural synergies exist between the two areas and the mutual benefits they can deliver. This approach is illustrated in Figure 8.

[14] http://www.scotland.gov.uk/Topics/Built-Environment/planning/Roles/Scottish-Government/Guidance
[15] http://www.scotland.gov.uk/Publications/2006/10/20095106/0
[16] http://www.scotland.gov.uk/Resource/Doc/47171/0026391.pdf
[17] http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Pollution-1/16215/PG09
[18] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf

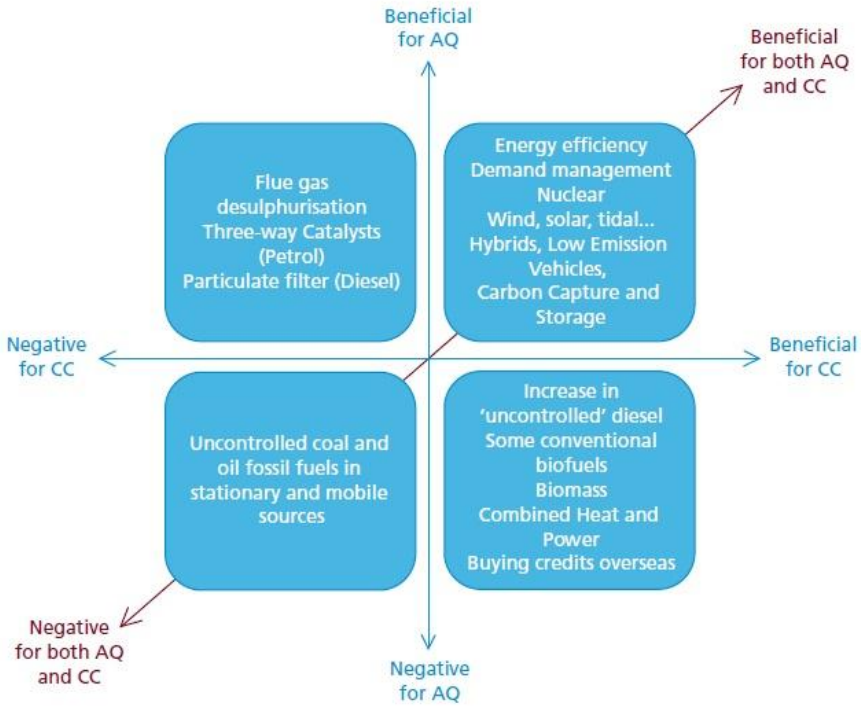


Figure 8 - Air quality and climate change interactions

In 2009 the Scottish Parliament passed the most ambitious climate change legislation anywhere in the world. The Climate Change (Scotland) Act 2009[19] requires Scotland to achieve at least 80% greenhouse gas emissions reductions by 2050 and also sets statutory annual emission reduction targets. 'Low Carbon Scotland: Meeting Our Emissions Reduction Targets 2013-2027 – The Second Report on Proposals and Policies'[20] (RPP2) sets out how Scotland intends to achieve these targets whilst at the same time delivering benefits for air quality and the wider environment.

The main issues of concern are emissions from transport sources. Combustion of petrol and diesel results in emissions of pollutants which can on their own, in combination, or by reacting with each other to form other pollutants, harm human health and contribute to global warming and climate change. Diesel cars are now the second largest source of NO_x emissions (29% of all transport related NO_x emissions in 2011[21]) and this has grown rapidly over the last 15 years, largely due to the focus on reducing greenhouse gas emissions. The greater fuel efficiency of diesel vehicles translates into larger CO_2 reductions which, together with lower rates of Vehicle Excise Duty and company car tax incentives, have encouraged the dieselisation of the UK fleet.

[19] http://www.legislation.gov.uk/asp/2009/12/contents
[20] http://www.scotland.gov.uk/Publications/2013/06/6387/0
[21] http://www.racfoundation.org/assets/rac_foundation/content/downloadables/racf_ricardo_aea_air_quality_report_hitchcock_et_al_june_2014.pdf

Diesel vehicles are also the main source of transport related PM emissions, but the difference in relation to petrol vehicles is much less than for NO_x, as fine particulate matter is also generated from brake and tyre wear and road abrasion.

5.6 Energy Today

The use of fossil fuels to produce energy impacts on air pollution. In order to minimise these impacts, a variety of steps can be taken, including:

- Making energy use as efficient as possible;
- Moving to renewable energy sources;
- Using less polluting fuels such as biomass and certain biofuels.

The adoption of bioenergy has been encouraged in recent years to reduce greenhouse gas emissions, mitigate against climate change effects and contribute to energy security and rural development. As part of its climate change commitments, the Scottish Government has ambitious targets to meet an equivalent of 100% electricity demand from renewable energy, 11% of renewable heat and an overall 30% energy demand from renewables, all by 2020. However bioenergy combustion leads to emissions of various air pollutants, especially fine particulates. Although the contribution to overall emissions is still relatively small, if the trend of increased adoption continues it is likely to become an increasingly significant source.

Emissions from well operated and maintained modern biomass boilers are generally lower than for coal or oil equivalents and, where biomass replaces these fuel types, the effect on air quality will be largely positive. However, when biomass boilers replace gas fired appliances in urban areas, where poor air quality may already be an issue, there is the potential for emissions to increase, unless appropriate abatement technology is employed and operating conditions set.

The Scottish Government has declared a preferred policy of biomass being deployed in heat-only or combined heat and power schemes and off the gas grid. In areas where AQMAs have been declared, the expectation is that biomass deployment will focus on larger, more efficient plant incorporating advanced filtration technology to minimise emissions. Further background can be found in the Scottish Government report on the potential cumulative impact of biomass boilers on urban air quality in Scotland[22].

5.7 Environment Today

Although the protection of human health is the main focus of air quality policy in Scotland, air pollution can also impact on the natural and built environments. Pollutants emitted into the atmosphere can travel over long distances, undergoing various chemical and physical changes before being deposited back to the ground. These pollutants can then have an adverse effect on the environment to which they are deposited. The overall impacts are dependent on the chemical changes to the pollutants concerned and the sensitivity of the environment.

[22] http://www.scotland.gov.uk/Publications/2008/11/05160512/0

Some parts of rural Scotland are under threat from air pollution that is generated in our towns and cities, with the rates of pollution deposition exceeding the Critical Loads (CL) for both nitrogen and acidification (a shown in Figure 9). Nitrogen-based pollutants are the main concern, particularly those derived from NOx emissions. Nitrogen enrichment is a significant issue, as many natural habitats are nitrogen limiting and therefore are sensitive to addition nitrogen sources. Further background on the relationships between land use and environmental impact can be found in the Land Use Strategy for Scotland[23].

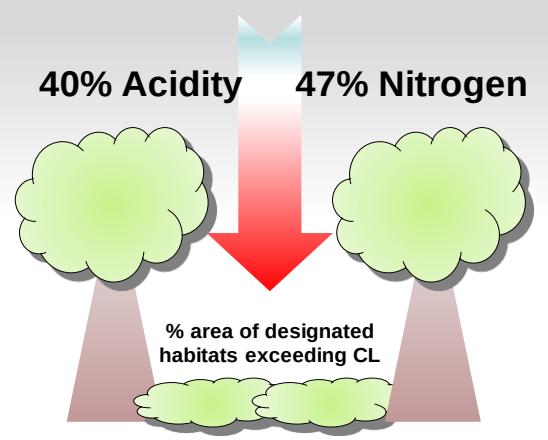


Figure 9 – Critical Loads for nitrogen and acidification

The deposition of acidic pollutants on the ground can accelerate the natural acidification process. The principal pollutants that contribute to acidification are SO_2, NO_X and NH_3. Others pollutants also contribute, but to a lesser extent. These pollutants undergo chemical changes both in the atmosphere and on the ground, resulting in the acidification of ecosystems and therefore potentially damaging the biodiversity of these ecosystems.

Groundlevel ozone (O_3) is a secondary pollutant, formed by the oxidation of other primary pollutants in the presence of sunlight. Levels of O_3 are generally higher in rural areas due to the long-range transportation of primary pollutants from urban source. In addition, O_3 reacts with nitric oxide (NO), which is more abundant in urban areas due to traffic emissions; therefore O_3 levels are usually lower in urban areas. However, we are seeing a progressive increase in urban O_3 primarily due to the reduction in NO from modern vehicle exhausts.

Historically, high pollutant concentrations in urban areas, notably black smoke and SO_2, caused significant damage to the fabric of buildings. Although we have seen a significant decline in such pollutants the legacy of damage to the stonework has made them more vulnerable to further decay today.

Further information on the interactions between air pollutants and the wider environment can be found on the Scotland's Environment website.

[23] http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy

6 The Way Forward

6.1 Air Quality Tomorrow

Central government cannot deliver improvements to air quality on its own. Achieving the aims of the LES requires a joint effort from the Scottish Government and its agencies, Regional Transport Partnerships, local authorities (transport, urban and land use planners and environmental health), developers, employers, businesses and citizens.

Experience from Low Emission Strategies introduced elsewhere in the UK and Europe shows that transformational change takes time. We must accept that some actions have long-term rather than short-term influence, and take effect over years, not months.

There is a perception that better air quality has limited economic benefit. Whilst taking action does indeed cost money - affecting both the public purse and commercial businesses – the realised benefits can be measured in terms of financial savings – for example through improved transport efficiencies, reduced fuel consumption and time saved through less congestion, and health and wellbeing improvements. One of our key objectives is to communicate this message to business and the general public in order to foster behavioural change. We know that reducing carbon emissions by using more sustainable travel will result in cleaner air. The LES therefore aims to link with existing Scottish Government Greener Scotland campaigns focused on greenhouse gas mitigation.

During 2013 a consultation on proposed changes to the LAQM system was undertaken. The consultation was based on a comprehensive review of LAQM undertaken in 2010 on behalf of all the UK administrations[24] which concluded with a substantial list of recommendations. An analysis of responses[25] to the Scottish Government's consultation sets out our proposals for a revised approach to LAQM.

ACTION: A revised Local Air Quality Management system will be introduced.

ACTION: $PM_{2.5}$ will be included in regulations for Local Air Quality Management.

ACTION: A $PM_{2.5}$ monitoring network will be established.

ACTION: On a prioritised basis, a 100% declassification of Local Air Quality Management Areas will be targeted.

ACTION: Full compliance with the EU ambient air quality Directive will be achieved.

ACTION: Compliance with the UK exposure reduction targets for $PM_{2.5}$ will be achieved.

[24] http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Pollution-1/16215/review
[25] http://www.scotland.gov.uk/Publications/2013/12/5214

There is also a need to strengthen policy linkages between air quality and environmental noise. The former UK Government Department for Environment, Transport and the Regions (DETR) produced a report in 2001, 'Determination of the Potential Synergies and Conflicts Between Noise and Air Quality Action Plans'. Whilst this report provides a good basis for considering the issues, it requires updating to take account of scientific, legislative and policy developments in the intervening period.

ACTION: Options for updating information on conflicts and synergies between air quality and noise will be considered.

6.2 Health Tomorrow

The Public Health Etc. (Scotland) Act 2008 requires each Health Board, in partnership with the constituent local authorities, to prepare a Joint Health Protection Plan. These Plans provide an overview of health protection (communicable disease and environmental health) priorities, provision and preparedness. Incorporating air quality considerations into Plans will strengthen links between air quality and health.

ACTION: A DPSEEA analysis of air quality and heath will be conducted.

ACTION: A communications strategy will be developed to convey health impacts of poor air quality.

ACTION: Health Board areas with AQMAs should ensure that the next revision of the Joint Health Protection Plan includes objectives relating to air quality and associated air quality action plans.

The WHO has set guideline PM_{10} and $PM_{2.5}$ values of 20 $\mu g\ m^3$ and 10 $\mu g\ m^3$ respectively as annual means[26]. These values are considerably more stringent than the equivalent EU and UK targets, but similar to the Scottish objectives of 18 $\mu g\ m^3$ and 12 $\mu g\ m^3$. The Scottish Government considers that there may be value in aligning the Scottish objectives with the WHO guidelines, both for consistency and because an increasing body of evidence suggests that $PM_{2.5}$ is the more significant fraction in terms of health impacts.

ACTION: Assess case for adopting World Health Organisation guideline values for PM_{10} and $PM_{2.5}$ as Scottish objectives.

ACTION: Regular scientific evaluations of the impact of the Low Emission Strategy on health will be undertaken.

6.3 Transport Tomorrow

Reducing transport emissions does not simply equate to a reduction in vehicle traffic volumes and/or journeys, albeit such reductions would almost certainly lead to lower air pollution concentrations. As 'air pollution is a systemic issue that requires a long-

[26] http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf?ua=1

term approach' across interdependent sectors[27] what is required is a combination of the following UNEP-endorsed strategies[28] that will collectively contribute to the reduction of transport-related air quality emissions:

- **avoiding** travelling through (i) planning regime that influences the spatial and temporal movement of vehicles and (ii) digital technology
- modal **shift** to lower emission transport modes and active transport, based on behaviour change.
- intelligent traffic system **management** that makes the most efficient use of the existing transport assets; to manage flows, speeds and accessibility of vehicles.
- **improving** combustion-fuel vehicle performance through engine technology combined with an uptake of ultra-low emission vehicles utilising a new network of charging infrastructure.

Certain powers related to vehicle management are reserved. A recent review by the RAC Foundation touched upon these powers and identified a number of recommendations, as listed below. We will work with the UK Government to consider these recommendations:

- Investigation into the merits of a scrappage scheme for the oldest, dirtiest vehicles;
- A review of fiscal instruments such as fuel duty, vehicle excise duty and vehicle tax disc to calculate the true cost to society, to avoid an unnecessary distortion of the market towards a particular technology or behaviour and to take account of emissions other than CO_2;
- Investigation of the merit of changing the test procedure for vehicles, by utilising the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) as a replacement for the New European Driving Cycle (NEDC), with an adaption to the latest Euro and CO_2 standards.

Measurement & modelling of transport roadside emissions.

Roadside monitoring of air quality emissions can also be improved through the use of low-cost sensors. Such technology is currently immature but early pilot studies offer encouraging results. Modelling of transport emissions relies on AURN station data; whilst such stations are necessary for monitoring compliance with regulations, they may not be located in the most suitable positions to inform transport modelling.

ACTION: Trialling of low-cost sensor technology that would enable roadside monitoring of air quality, in order to underpin urban traffic modelling, will take place.

Transport planning

Transport authorities at national and local level must demonstrate how improvements to air quality have been given due consideration in transport planning, in tandem with other factors such as carbon reduction and economic growth.

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[27] http://www.racfoundation.org/assets/rac_foundation/content/downloadables/racf_ricardo_aea_air_quality_report_hitchcock_et_al_june_2014.pdf

[28] http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_10_Transport.pdf

Intelligent traffic system management

Figure 3 has shown that traffic volumes year-to-year in Scotland since 2003 have been relatively consistent, so focusing on managing and optimising traffic flow on our existing road network (to avoid congestion and start-stop motions which disproportionately release more particulate matter) may offer a more realistic short-term gain in air quality.

ACTION: Local authorities will review traffic management procedures and ensure that traffic flow is optimised.

ACTION: Options for local authorities to use resident and visitor policies to encourage low emission vehicles will be explored.

Avoiding Travel

The greenest mile is the mile not travelled; zero travel equates to zero emissions from transport. Scotland's Digital Future has a role to play in not only securing the transition to a low carbon economy, but also enabling employers to replace physical travel of their goods, services and staff with virtual equivalents. National Planning Framework (NPF3) has identified a digital fibre network linking our most peripheral communities as a national development. Digital technologies will offer virtual connectivity through high quality mobile and fixed broadband connections for communities and businesses for rural and urban areas. Employers should also consider adoption of mobile and flexible working encompassing a mix of working from home, working from multiple offices and non-office mobile working.

Active Travel - Walking and Cycling

A close relationship exists between air quality, environmental noise, traffic congestion and active modes of transport. Walking, cycling or outdoor exercise help to improve the quality of life and well-being of people in communities across Scotland by offering positive impacts on both air quality and environmental noise. Gains include physical and mental fitness which can engender improvements in workforce production along with traditional economic gains such as saving money on fuel and supporting local economies from increased footfall. Maximising the benefits of green infrastructure is covered in SPP.

The National Walking Strategy, launched in June 2014, is a key element in delivering our ten year Physical Implementation Plan, *A More Active Scotland - Building a Legacy from the Commonwealth Games,* and aims to promote modal shift to walking.

A national long distance cycling and walking network has been designated as a national development in the NPF3. The NPF3 also encourages local authorities to develop at least one exemplar walking- and cycling-friendly settlement to demonstrate how active travel networks can be significantly improved in line with meeting our vision for increased cycling. These settlements, as well as wider core path networks, will act as key nodes on the national walking and cycling network.

We will continue to work with all partners to deliver the actions in the Cycling Action Plan for Scotland (CAPS), working jointly towards our shared vision that by 2020, 10% of all everyday journeys in Scotland will be undertaken by bike

Paths for All will establish a new delivery forum for the NWS, and will work in partnership with the Cycling Action Plan for Scotland (CAPS) Delivery Forum.

ACTION: Paths for All will establish a new delivery forum for the National Walking Strategy, and will work in partnership with the Cycling Action Plan for Scotland Delivery Forum.

ACTION: Work collaboratively with our delivery partners towards our shared vision that by 2020 10% of everyday journeys will be made by bike.

ACTION: All local transport strategies will include policies to deliver a modal shift away from private vehicle use.

Public Transport (bus, rail and other modes)

Buses are the most frequently used and most widely available mode of public transport in Scotland. Compared with cars, a well used bus occupies less road space and generates fewer emissions per passenger. Bus services operate largely in a deregulated market with the private sector providing most services and local authorities commissioning and supporting services required to meet social needs which the commercial market is unable or unwilling to provide.

To support the network, Transport Scotland provides Bus Service Operators Grant (BSOG). BSOG is a subsidy based since 2012 on mileage run. It includes a premium double rate for services operated by low carbon vehicles. Since 2012, the annual budget and payment rates have been maintained in cash terms at £50 million and 14.4p per km respectively (with higher rates for low carbon emission buses and for sustainable biodiesel).

The Scottish Green Bus Fund, launched in 2010, has complemented the premium rates provided by BSOG to incentivise the purchase of cleaner new buses that emit fewer pollutants. Operators, local authorities and RTPs bid into a challenge fund which can fund up to 80% of the difference in costs between a low emission vehicle and its diesel equivalent. By 2014, £10.1m had been awarded to operators for the purchase of 126 new Low Carbon Emission Buses. Transport Scotland will work with stakeholders to review and improve the scheme taking account of technological and market developments since its launch.

Additionally, we launched the Bus Investment Fund (BIF) in 2013 as an annual challenge fund to support the work of local authorities, RTPs and operators by providing funding for projects to improve bus services. BIF is a flexible fund and in its first round has supported a range of projects, including initiatives to give priority to urban bus services and to improve the quality of passenger information in real time and at stops. Transport Scotland will evaluate BIF-supported projects to assess the outcomes which they deliver and provide examples of good practice to inform future national, regional and local initiatives.

Local authorities can use investment in local infrastructure to raise standards, including Statutory Quality Partnerships (SQPs), through which conditions can be imposed on operators in order to qualify for access to improved facilities. Transport Scotland is working with stakeholders to identify options – including possible changes in the regulatory framework – which might make SQPs easier to set up or more effective.

Operators themselves can find action to reduce emissions beneficial, whether by reducing operating costs by saving fuel, providing a more attractive service to customers or meeting standards necessary to operate, whether to meet local traffic regulation conditions or gear up in good time for future regulatory changes. Whether or not emissions reduction is a specific goal, strengthening European standards mean that new vehicles entering the fleet have to meet increasing high air quality standards.

Improved public services through digital technology is a goal of the Customer First programme, with one example being the National Entitlement Card (NEC), which is a smartcard that underpins the concept of integrated ticketing. The NEC enables people to access bus and rail concession services conveniently. Making public transport easier to access, along with the shortening of journey times, will support modal shift.

ACTION: Work with operators and local authorities to review and improve the Green Bus Fund scheme, taking account of technological and market developments.

ACTION: Evaluate Bus Investment Fund supported projects and generate good practice examples to inform future national, regional and local initiatives.

ACTION: Consider how statutory quality partnerships could be made more effective.

Low Emission Vehicles

We are committed to freeing Scotland's towns, cities and communities from the damaging effects of petrol and diesel fuelled vehicles by 2050, and phasing out half of all petrol and diesel fuelled vehicles from our urban environments by 2030. A significant reduction in greenhouse gas emissions will be accompanied by marked improvements in local air quality, noise pollution and public health. Scotland will also enjoy increased energy security and economic opportunities through leadership in sustainable transport and energy technologies.

Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles[29], sets out the measures we and our partners will take to accelerate the uptake of plug-in vehicles in order to help us achieve this vision.

Transport Scotland has already invested over £10 million in plug-in vehicles and infrastructure. More than £17 million will be invested in a range of projects between

[29] http://www.transportscotland.gov.uk/report/j272736-00.htm

2014 and 2016, helping to make low emission vehicles more accessible to the Scottish public and Scottish businesses.

Funding will include continued development of the ChargePlace Scotland EV charging network[30], which currently comprises 500 publicly accessible points throughout the country, and continued development of a network of rapid charging points at least every 35 miles on Scotland's primary road network (with the capability of charging an electric car in 20 to 30 minutes). We are also providing over £2.5 million to help the Scottish public sector analyse their fleets and replace polluting fossil fuelled cars and vans with low emission alternatives.

Hydrogen fuel cell electric vehicles provide another solution to the problem of transitioning away from dirty fossil fuelled vehicles to lower emission cars and vans. Transport Scotland is taking an active role in preparing for the rollout of these vehicles, for example through representation on the industry/government UK H_2Mobility coalition[31] and being a funding partner in the Aberdeen Hydrogen Bus Project[32]. This initiative will see Europe's largest fleet (ten in total) of zero emission hydrogen fuel cell buses entering service, as well as the UK's first large scale green hydrogen production and refuelling facility.

As well as hydrogen for transport, we are also working with key stakeholders to investigate the wider environmental and economic opportunities of using hydrogen for energy applications – especially in promoting renewables, energy balancing and storage.

ACTION: The Low Emission Strategy will support delivery of the actions contained in Switched On Scotland: A Roadmap to Widespread Adoption of Plug-In Vehicles.

ACTION: Work with key partners to investigate the use of hydrogen as a transport fuel, as well as exploring wider environmental and economic opportunities of using hydrogen for energy applications – especially in promoting renewables, energy balancing and storage.

Freight

The freight industry plays a significant role in ensuring that fresh food and other essential commodities are available daily in our shops and supermarkets - an essential service for all of Scotland. The transportation of goods is commercially driven, so the public sector has to work in partnership with those businesses involved in the moving and receiving of goods to identify interventions that can improve air quality, but still make commercial sense.

At the national level, Transport Scotland works with partners in the freight sector to develop efficiencies and support sustainable practices through our freight stakeholder group: the Scottish Freight Logistics Advisory Group (ScotFLAG). At a regional level, Freight Quality Partnerships or Forums have been set up by most

[30] http://www.greenerscotland.org/greener-travel/electric-vehicles/chargeplace-scotland
[31] http://www.ukh2mobility.co.uk/
[32] http://aberdeeninvestlivevisit.co.uk/Invest/Aberdeens-Economy/City-Projects/H2-Aberdeen/Hydrogen-Bus/Hydrogen-Bus-Project.aspx

Regional Transport Partnerships to address freight issues (including the environmental impact of freight transport). At the local authority level, engagement with the road freight sector on improving environmental performance is taking place via schemes such as ECO Stars.

Where evidence suggests poor air quality in a specific location is caused by freight vehicle movements, a local partnership can help identify changes that will both reduce pollution, and make commercial sense. We are keen for this partnership approach between all levels of Government and business to continue, and will facilitate this by refreshing the guidance on setting up Freight Quality Partnerships.

ACTION: Continue to support and develop the ECO Stars programme in Scotland.

ACTION: Guidance on establishing Freight Quality Partnerships will be reviewed and revised where necessary.

6.4 Development Tomorrow

Planners have a key role to play in facilitating spaces that are designed to avoid air quality deterioration in the short term and enhanced in the long term. Planners are encouraged to engage with environmental health officers, transport managers, SEPA and other partners to understand how spatial planning and development management can contribute to better air quality. Key actions include designing places where communities can be less reliant on motorised transport and ensuring that development plans are subject to transport impact appraisal.

Preparation of development plans and consideration of individual planning applications should:

- Demonstrate how the land use planning system can contribute to the achievement of the LES planning objective;
- Investigate and clearly explain how new developments might impact on existing and likely future air quality, particularly in and around AQMAs;
- Where practicable, locate new developments so that they reduce the need to travel and/or offer good access to public transport; and
- Ensure that planning decisions align with, and support delivery of, air quality action plans.

ACTION: Local authorities are required to take account of the objectives and policies in the Low Emission Strategy*[33] in preparation of Development Plans and when undertaking Development Management.

ACTION: The objectives and policies in the Low Emission Strategy should be considered as part of the Community Partnership Planning process.

[33] Under section 88 of the Environment Act 1995, local authorities are required to have regard to any guidance issued by the Scottish Ministers when undertaking their air quality duties outlined in the Act.

ACTION: Local authorities with air quality issues to review supplementary guidance and revise at the next scheduled update (i) to take account of action to improve, air quality whilst (ii) aligning with Low Emission Strategy objectives.

ACTION: Scottish Planning Policy expects planning authorities to appraise the impact of development plans on the transport network.

We must ensure that planners have access to, and are made aware of, information that can facilitate better air quality. Clear, simple supplementary guidance or protocols on mitigation of air pollution in urban and rural spaces can be developed to support this. Ideally it should be done on a regional basis and such guidance can then be adapted by individual local authorities to suit their specific circumstances.

ACTION: RTPI to collaborate with the Strategic Development Planning Authorities and the Scottish Government in the development of regional supplementary guidance on air pollution mitigation.

Strategic and local development plans are required to undergo a Strategic Environmental Assessment (SEA). This provides the opportunity to predict the potential effects of these plans, and associated individual developments, on air and climate, and ways in which these effects can be mitigated. We must be able to demonstrate that air quality is being considered consistently throughout this process.

ACTION: Planning authorities should ensure that where potential air quality effects are identified as significant during the SEA process, the issues are considered in the preparation of development plans.

In preparing development plans, planning authorities are expected to appraise impacts on the transport network in line with Transport Scotland's Development Planning and Management Transport Appraisal Guidance (DPMTAG)[34]. Appraisals of development plans in or around existing or potential AQMAs should clearly and succinctly outline how changes to the transport network may impact on local air quality.

Spatial strategies set out in strategic and local development plans should support development in locations that allow walkable access to local amenities and are also accessible by cycling and public transport. Plans should identify active travel networks and promote opportunities for travel by more sustainable modes in the following order of priority: walking, cycling, public transport, cars. Plans should also facilitate integration between transport modes.

Air quality action plans must provide clear direction on when an air quality assessment is required and what issues should be covered in relation to developments in a given spatial area. Measures that can mitigate air quality impacts should also be included within air quality action plans, including situations where the mitigation should be incorporated into proposals as standard.

[34] http://www.transportscotland.gov.uk/development-planning-and-management-transport-appraisal-guidance-dpmtag

ACTION: All local authorities with AQMAs should ensure that their air quality action plans provide clear advice on air quality assessment, and mitigation.

Where development plans indicate that a travel plan will be required to accompany a proposal for a development that will generate significant travel, that travel plan should address how the air quality implications will be managed. Travel plans can be effective in reducing trips and encouraging modal shift, but travel plan implementation must be monitored. Local authorities should also show leadership by adopting corporate travel plans which are fully consistent with, and integrated into, any local air quality action plan. As with developer travel plans, implementation and progress should be monitored.

ACTION: In developments where travel plans are required, developers should ensure that potential air quality impacts are addressed. A procedure for monitoring plan implementation should also be put in place and reported upon.

ACTION: All local authorities should ensure that they have a corporate travel plan which is consistent with any local air quality action plan.

For any development with potential air quality impacts, discussions between planning authorities and developers should start at the pre-application stage. Such engagement will allow potential air quality issues to be identified early. Optimising a design is preferable to expensive and difficult retrofit mitigation measures once a development is constructed.

Both the impacts from individual developments and the cumulative impact of incremental emissions require consideration. A possible approach for mitigating the cumulative impacts of transport emissions from land use development could be to establish a central low emissions fund. Such a fund might be operated by individual local authorities or on a regional basis, with standard contributions required for developments over a certain size.

ACTION: Strategic Development Planning authorities and local authorities to consider whether a central low emission fund would be appropriate for their circumstances; if so, a feasibility study should be commissioned to inform development of such a fund.

If it is considered that a development could have significant local or regional adverse air quality impacts, an air quality assessment may be required to determine the likely increase in relevant air quality exposure. Such an assessment will be based on the existing Scottish monitoring network or modelling data, and by use of the national modelling methodology. Additionally the local authority may require the developer to undertake a fixed period of specific monitoring and to propose effective mitigation.

Where public transport services required to serve a new development cannot be provided commercially, a contribution from the developer towards an agreed level of service may be appropriate. Planning authorities should give careful consideration to ensuring that low emission and/or low carbon vehicles form the basis of such service provision.

Large scale mixed use developments that impact on air quality in the short term may provide opportunities for longer term emission reduction through good spatial design where the need to travel is reduced or through the adoption of low emission fuels and technologies.

ACTION: Planning authorities should use the national modelling methodology as a first step in assessing the potential impact of a development, building in local and development specific monitoring and modelling data as appropriate.

ACTION: Where mitigation measures are required for a development in order to manage air quality effects of development, in accordance with current Scottish Government guidance on planning and air quality, these could be applied through conditions on a planning permission. The use of planning obligations may be appropriate in some circumstances.

6.5 Climate Change Tomorrow

Climate change mitigation will bring additional benefits for air quality, which in turn may realise human and ecosystem health gains. Committed climate change actions which may help protect and enhance air quality include:

- Our road transport sector is almost completely decarbonised by 2050;
- Our homes and businesses are connected to heat networks or heated by renewable heat sources;
- Our heating and electricity is provided through a mixture of nuclear, non-combustion renewable, and pre-combustion carbon capture and storage equipped fossil fuel generators;
- Our remaining hydrocarbons are confined to chemical processes (plastics, pharmaceuticals, process chemicals, etc.);
- Our agricultural demand for nitrogen is greatly reduced and a high level of ambition is set for NO_2 emissions reduction.

ACTION: Scottish Government and local authorities will endeavour to ensure that policies designed to control greenhouse gas and/or air pollutant emissions are not in conflict with each other (for national plans and local air quality action plans respectively), and are integrated to maximise co-benefits.

6.6 Energy Tomorrow

In 2012, the Minister for Environment and Climate Change wrote to the Chief Executive of COSLA setting out the Scottish Government's policy position on air quality and biomass[35]. Local authorities must be able to demonstrate how their approach to bioenergy planning applications take air quality impacts (particularly in or near AQMAs) into account

[35] http://www.scottishairquality.co.uk/assets/documents/news/letter.pdf

ACTION: Local authorities are expected to ensure that the national policy position on air quality is taken into account when considering bioenergy applications in their areas and when developing local policies.

6.7 Environment Tomorrow

The Air Quality Strategy sets objectives for the protection of vegetation and ecosystems from atmospheric NO_2 and SO_2, based on a critical levels approach, i.e. concentrations of pollutants in air above which damage to sensitive plants and habitats may occur. In addition to NOx and SO_2, the other main pollutants of concern for vegetation and ecosystems are ammonia (NH_3) and ozone (O_3). The adoption of the Convention on Long-Range Transboundary Pollution sets out the framework for reducing key pollutants, in response the EU has developed a series of policy measures to limit the level of transboundary pollution, including the National Emissions Ceilings Directive and the Large Combustion Plant Directive that set out the emission limits for a country in order to reduce the contribution of air pollution to atmospheric deposition. Although the directive has achieved significant reductions to point source industry, the same extent of reduction have not been reached with traffic emission sources.

ACTION: To continually promote the reduction of total emissions to ensure protection of the natural environment.

6.8 Behaviour and Communications Tomorrow

Air pollution is largely invisible and influencing individuals' behavioural change will require a clear communications strategy focused on actions people can take. Communications will draw on key motivations linked to these actions, primarily health and environmental benefits. The existing Greener Scotland approach, focus on the key climate change behaviours for households, has an ongoing campaign to encourage more people to give up the car and walk or cycle for shorter journeys. The campaign is focused on promoting the health and environmental benefits of this action. Links can also be created with other initiatives such as Environmental Protection Scotland's 'Breathe Scotland' campaign[36].

The goal must be to make business and the general public:

- Well informed, knowledgeable and responsible for their contribution in protecting and enhancing air quality, with a specific focus on the health and wellbeing impacts and benefits; and
- Aware of the actions that they personally can take to reduce their own pollution footprint.

Currently, air quality lacks a single indicator that is recognised and easily understood by the general public and others in the way that CO_2 emissions are associated with climate change. A key obstacle to developing such an indicator for air quality is the range of different pollutants that contribute to air pollution. The Daily Air Quality Index (DAQI), which is used by most air pollution information services in the UK and is based on a banding system approved by COMEAP, is the best currently available

[36] http://www.breathescotland.org.uk/

representation of overall air pollution and will be promoted more widely as part of any public information campaigns.

ACTION: The LES will support the ongoing Greener Scotland communication campaigns, encouraging individuals to use the car less to improve their health and their local environment.

ACTION: The Daily Air Quality Index will be adopted as the key air quality indicator.

7 National Modelling Framework

7.1 Background

The successful implementation of the actions contained in this Strategy will require assessment of a range of measures which could potentially improve air quality in urban areas. Modelling the potential effectiveness of these measures is a necessary part of the process.

It is essential that the LES is supported by modelling and data analysis undertaken in a consistent manner. A national modelling and assessment framework has therefore been developed. The national framework provides a standardised approach to modelling air quality at the regional and local scales, feeding directly into existing tools that will assist local authorities in the land use and transport planning process and help them to explore possible Low Emission Zone (LEZ) scenarios.

A national framework (as shown in Figure 10) ensures that, although the issues and sources may differ between authorities, the decision making process is undertaken throughout Scotland consistently and to the same standards.

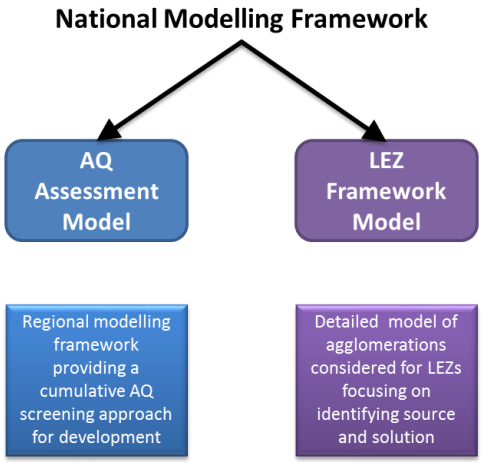

Figure 10 – National Modelling Framework

The framework is being developed by SEPA and key partners, incorporating lessons learned from previous work in the UK and beyond. It consists of:

- Guidance documents outlining the essential modelling and data requirements;
- Best practice on the analysis and presentation of modelling and data outputs;
- Guidance on how to deal with modelling uncertainties; and
- Web-based interactive data products.

Uncertainties in modelling, particularly relating to estimates of emissions from traffic, pose a risk to successful identification of effective measures. Therefore a good understanding of the breakdown of traffic data is vital for accurate emissions

estimations and for assessing the potential air quality issues to be addressed. It is essential that there are detailed and high quality traffic data available across Scotland, especially in densely populated city centres and surrounding areas.

7.2 Air Quality Assessment Model

The objective of the Air Quality Assessment (AQA) model is to help deliver compliance with air quality standards, while at the same time providing the mechanism to assess proposed developments which may impact upon air quality. The AQA model is a development-based screening methodology that takes a regional approach in considering developments within larger agglomeration areas. It will initially cover the Strategic Development Planning (SDP) Authorities:

- Aberdeen City and Shire (covering Aberdeen);
- Glasgow and the Clyde Valley (covering Glasgow);
- SESplan (covering Edinburgh); and
- TAYplan (covering Dundee and Perth).

This approach will ensure that both region-wide and cross-boundary issues will be dealt with in local authority areas, for example relating to housing or land development and the transport infrastructure.

The AQA modelling process should follow the SDP cycle as closely as possible, identifying large-scale development opportunities and strategic transport planning and promoting closer collaboration between the local authorities in each SDP region. This will cover both the potential cumulative effects of development on air quality and contribute to the evidence base for establishing LEZs. The approach could also be potentially adapted to smaller urban centres or other more localised areas with cross-boundary issues relating to transport.

7.3 Low Emission Zone Framework Model

Low Emission Zone (LEZ) feasibility studies usually start with identifying emissions sources, followed by developing appropriate forecasting scenarios before selecting measures required to achieve the necessary reductions. The LEZ Framework Model is intended to assist in this process.

Although many LEZ studies look at generating base year data which could be several years out of date, it is preferable to undertake a more recent fleet composition study and vehicle survey for more accurate estimates of the current fleet, separating out taxi and bus composition. In addition, forecasting is used to consider the future improvements to the fleet before any intervention is introduced within an LEZ. The LEZ framework will set out the guidance that should be followed when implementing the appropriate measures, to ensure consistency across Scotland. This is covered in more detail in Chapter 8. In addition, the guidance on the LEZ Framework Model will set out the requirements needed for building the model and undertaking scenario testing.

As part of the national modelling framework, SEPA is developing interactive tools for facilitating the outputs from the LEZ Framework Model. These tools will be designed

to test the impacts of potential transport-related interventions, such as bus priority measures, fleet improvement plans and traffic management initiatives.

ACTION: A national air quality modelling methodology will be developed.

8 National Low Emission Zone Framework

8.1 Background

The concept of Low Emission Zones (LEZs) has been established for some years. An LEZ involves a city or local authority setting vehicle emissions limits in defined areas where poor air quality is an issue. Any vehicles which do not meet the required LEZ standard are restricted or deterred from entering the area concerned, either by exclusion (full or partial) or by charging.

There are ~200 planned or operational LEZs of various sizes across 13 European countries with the majority in Germany (see case study) and Italy but to date few LEZs have been introduced in the UK, other than the well known London scheme. No LEZs have been introduced in Scotland, although cities such as Glasgow, Edinburgh and Aberdeen have conducted LEZ feasibility studies.

8.2 Benefits and Barriers

The main benefits of LEZs include:

- Reduced emissions and improved air quality, contributing to national and local environmental, health and economic objectives;
- Higher vehicle replacement costs, but overall improved fuel efficiency;
- Reduced consumer transport costs from using more efficient modes of transport; and
- In Scotland, supporting the move to almost complete decarbonisation of the road transport sector by 2050.

The real and perceived barriers for LEZ implementation include:

- a perception that restricting or deterring vehicles from parts of town and city centres is inequitable or could adversely impact on the local economy. Evidence from Europe suggests that, with careful planning, scheme design and management, this need not be the case;
- Ensuring LEZ implementation and running costs are affordable, controllable and provide an appropriate level of benefit;
- A reluctance to commit financial and human resources towards establishing an LEZ when the realisation of benefit can be uncertain.

Feedback from local authorities and others during development of the Low Emission Strategy suggests that a national framework would do much to encourage a shift from feasibility to implementation. Currently, local authorities have powers to establish LEZs in their areas and set their own emissions standards and operating procedures. Whilst this gives the flexibility to create specific solutions for local issues, it means transport operators potentially having to comply with a different set of local conditions each time their vehicles enter a different LEZ, with potential economic and practical negative impacts. This framework therefore sets criteria and procedures applicable across Scotland, providing certainty and consistency for all who would be affected. These criteria and procedures are mandatory, but within this framework, individual or regional groupings of local authorities should develop their own approach to LEZ implementation based on their own particular circumstances.

The LEZ approach may not be the answer for every area with air quality issues. However all local authorities with existing or potential AQMAs must undertake the screening assessment outlined in Annex B. If this concludes that an LEZ is appropriate for a given area, the Scottish Government will expect the local authority concerned to proceed with next stages of the process, as summarised in the diagram below.

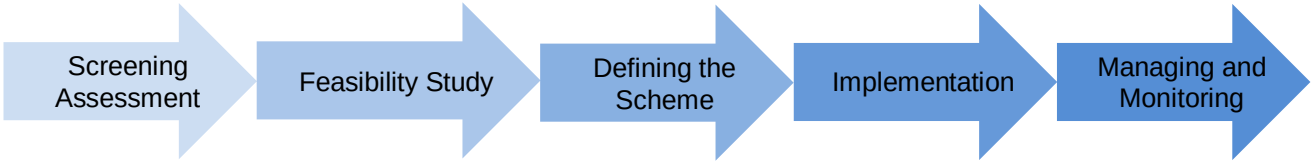

Figure 11 - LEZ assessment procedure

ACTION: A screening procedure for assessing LEZ requirements will be produced.

ACTION: A national LEZ Framework will be developed.

The Framework and assessment procedures are described in detail in Annex B.

Case Study – Bremen[37]

Germany has a national LEZ framework, within which design and implementation decisions are made locally. All German cities with an LEZ use the national vehicle classification system that is based on vehicle emission standards. The standards are consistent but the timescales for implementation may vary.

- Class 2: All diesel vehicles at Euro 2 for Particular Matter + all petrol Euro 1
- Class 3: All diesel vehicles at Euro 3 for Particular Matter + all petrol Euro 1
- Class 4: All diesel vehicles at Euro 4 for Particular Matter + all petrol Euro 1

Germany has adopted a low-tech approach to LEZ enforcement, with colour coded windscreen stickers following the red/yellow/green criteria shown above. Enforcement is conducted via traffic wardens and fines and/or points are added to a drivers licence.

Bremen is a city of 548,000 inhabitants. Just over 40% of inhabitants journeys are by car or motorbike with 45% by active travel, but a high proportion of freight traffic passed through the city to access the port area and freight village.

Monitoring established that 10% of the traffic was responsible for 50% of NO_2 emissions; largely from diesel HGVs. A measureable increase in NO_2 after 2000 was identified, which coincided with the introduction of the Euro 3 engines and turbo rechargers.

Bremen introduced an LEZ in 2009, with three key policies:

- The most polluting vehicles were targeted and removed from the problem areas. Euro 1 and 2 vehicles were banned from entering the LEZ and, in mid 2011, only diesel vehicles with Euro 4 or above (+ Euro 3 with filter) were permitted;
- Traffic congestion was addressed. Intelligent traffic light systems were installed allowing traffic to move more freely, with priority given to buses and trams; and
- Cycling was actively promoted.

Since 2009, reductions in PM_{10} and NO_2 have been observed.

To incentivise Euro 5 uptake fleet-wide agreements were set up with freight operators. In return for purchasing Euro 5 vehicles, any Euro 3 vehicles in the fleet were allowed to operate in the LEZ for longer. This allowed operators to extend the use of serviceable existing vehicles against the early introduction of much cleaner fleet purchases. This arrangement with operators was essential for overall acceptance of the LEZ in Bremen, together with robust enforcement and a clear publicity and engagement strategy.

[37] http://www.slideshare.net/STEP_scotland/05-lez-summit-n-ox-and-the-city-michael-glotzrichter?related=1

9 Key Performance Indicators

9.1 Background

It is important that a methodology is in place for monitoring progress with the Low Emission Strategy. At central government level, this will be done through regular reporting on the key outcomes and objectives. For local authorities, a series of Key Performance Indicators (KPIs) is proposed. The suggested KPIs are:

- % reduction in NO_2 at each monitoring location, averaged over a three year period.
- % reduction in PM_{10} at each monitoring location, averaged over a three year period.
- Share of public transport journeys in the overall modal split – % change and/or comparison to the national average.
- Share of low emission vehicles in the overall modal split - % change and/or comparison to the national average.
- Share of cycling and walking journeys in the overall modal split - % change and/or comparison to the national average.
- Mean travel to work time - % change and/or comparison to the national average.
- Cycle path network density - % change.
- Fraction of mortality attributable to particulate air pollution.

9.2 Measurement and Reporting

The intention is that these will be reported on annually and have been designed so that the information required should mostly be already available, thereby keeping to a minimum the additional work required. Local authorities should gather the necessary information on an annual basis and include it as an annex to their air quality progress reports.

Annex A – Consultation Process

A description of the consultation and workshop process (including STEP and COSLA consultation), with a table of the key findings and a list of all organisations that contributed. Three consultation workshops were held during 2014 to inform the content of the Low Emission Strategy and to provide an opportunity for as many interested parties as possible to contribute to the process:

28 May – Edinburgh – Planning
3 June – Glasgow – Business, Transport and Freight
11 June – Stirling – Renewable Energy

Each workshop was based on a series of eight general questions, plus three specific questions related to the themes of the individual workshops.

General questions

1 What are the benefits of good air quality?
2 What key new actions, i.e. not things being done already, would you like to see included in a Low Emission Strategy? Is there anything specific you would *not* want to see?
3 What are the barriers, perceived or real, to a successful Low Emission Strategy?
4 How could and should a Low Emission Strategy contribute to sustainable economic growth in Scotland?
5 Behavioural change and modal shift, how do we effectively engage the public to reduce traffic, improve air quality and improve personal, family and community health and wellbeing?
6 Performance indicators, could these be an effective approach for measuring progress and, if so, what should they be?
7 Should a conventional Low Emission Zone framework be included within the Strategy?
8 Do you have any concerns about the potential impact of a Low Emission Strategy?

Planning questions

P1 What role should planning and development control play in contributing to an effective Low Emission Strategy?
P2 How can we improve connectivity and /or reduce the need to travel between residential areas and key services, such as workplaces, schools, shops, doctors and leisure activities, thereby reducing emissions and improving health and wellbeing?
P3 What are the actual/potential issues relating to planning that may negatively impact on a Low Emission Strategy? How can these be addressed?

Business, Transport and Freight questions

B1 How could a Low Emission Strategy be used to influence and improve the movement of goods in AQMAs, and what new business opportunities could arise from such a Strategy, particularly in relation to the movement of goods?

B2 What are the actual and potential barriers which prevent or hinder the freight, transport and business sectors from taking action to improve air quality? How can these be overcome?
B3 What elements of a Low Emissions Strategy could have a negative impact on the freight and/or business sectors? What could be the positive impacts? How can these be addressed to avoid such an outcome?

Renewable Energy questions

RE1 What are the key renewable energy technologies that can contribute to a successful Low Emission Strategy, and what are the actual and potential opportunities and obstacles relating to this contribution?
RE2 How can renewable energy and air quality policies be co-ordinated for maximum benefit?
RE3 How can we encourage the routine incorporation of renewable technologies into new developments (for example solar voltaic, solar water heating, electric charging points for electric hybrid cards, ground/air pumps)?

Workshop attendees
2020 Climate Group
Ricardo-AEA
AECOM
Central and East Pollution Group Dundee City Council
Chartered Institute of Transport and Logistics
City Car Club
City of Edinburgh Council
Confederation of Passenger Transport
Convention of Scottish Local Authorities (COSLA)
Dundee City Council
East Ayrshire Council
East Dunbartonshire Council
East Renfrewshire Council
ECOSTARS
Energy Saving Trust
Environmental Protection Scotland
First Group
First Scotrail
Friends of the Earth Scotland
Glasgow Centre for Population Health
Glasgow City Council
Health Protection Scotland
Iberdrola
Innovation Centre for Sensor and Imaging Systems
JW Suckling
Keep Scotland Beautiful (SSN)
Lothian Buses
NESTRANS
NHS Scotland
NHS Tayside
North Ayrshire Council
Pronto Pedal Power
Royal Environmental Health Institute of Scotland
Road Haulage Association

Royal Town Planning Institute (RTPI)
Scottish Environment Protection Agency (SEPA)
Scottish Government Onshore Renewables and Community Energy Team
SESTRANS
Strathclyde Partnership for Transport (SPT)
Transform Scotland
Transport Scotland
University of Edinburgh
University of Strathclyde
West Lothian Council
WH Malcolm

At each workshop, attendees were divided into small discussion groups, each with a facilitator (except Stirling, where the small number of attendees meant that there was just one discussion group). The following table summarises the key points raised during the discussions, which have been taken into account during development of the draft Strategy.

	Edinburgh	Glasgow	Stirling
Q1	• Better health and well-being. • Improved environment and sustainability. • Improved economy.	• As Edinburgh, plus compliance with EU legislation.	• As Edinburgh and Glasgow.
Q2	• Clear governance with Incremental targets supporting ambitious targets. • Utilising traffic regulation orders and traffic management. • Joined up policies and organisational agendas.	• Alternative fuels for all tiers of users. • New procurement rules within legislation to would force haulers to meet emission criteria. • Framework and planning to allow for braver decisions.	• Clear timeframes behind objectives set. • Use of a cost-benefit analysis to determine best options. • Inform the public of issues, pollutant and sources their contribution to the air quality issue.
Q3	• Lack of economic advantage related with low emission vehicles. • Political will and links to local government. • Lack of public understanding and acceptance for the need to change	• Lack of incentives for pioneering good practice. • Lack of political support and buy in from all levels; freight to government. • Lack of resources and education information.	• Costs of implementation. • Political will at local and national level. • Assessment of regional and local actions.
Q4	• Alignment with sustainable economy objectives and/or criteria. • Promote and explore the business case behind CSR and clean technologies. • Improve air quality to improve Scotland's image. Better place to work, live and visit.	• Locally specific projects with sustainable development justification. • Cleaner country image helps with marketing and tourism. • Business case behind cleaner technologies and incentives for good performance.	• Promotion of jobs associated industrial and manufacturing sectors. • Health and wellbeing improvements resulting in health care savings. • Inward investment due to associated improvements to towns and cities.
Q5	• Update the National Transport Strategy. • National visibility of air quality. National	• Campaigns and information availability e.g. Breathe Scotland to educate and encourage behaviours.	• Providing alternative forms of transport which should not result in disadvantaging the public

	campaigns and communication to educate. • Strengthen the capability of and capacity of sustainable transport.	• More integrated and cheaper public transport. • Financial incentives not to travel by car.	sector. • Improved facilities on public transport. • Promotion of active travel such as walking and cycling.
Q6	• Should be locally relevant and driven by lowering emissions, sustainable transport and strategic considerations. • Have to be timely, inform stakeholders and have value in order to influence decisions. • Require a cause and effect link with the target proposed.	• SMART form, achievable yet not too simple. • Should be communicated with transparency. • Long-term indicators for AQ and health.	• Tie into actions. • Have a wider scope than just pollutants. • Align attitudes to drive change.
Q7	• A consistent approach is vital. • Use of procurement power could prove valuable in a framework. • Centrally driven with local decisions on the location of LEZs.	• Toolkits with realistic and measurable targets. • Alternatives are available e.g. emission standards for vehicles and not just applied within a LEZ. • Follow by example and monitor success.	• Overarching framework which is centrally governed to set standards for local authorities. • Health considerations must be at the forefront of this framework. • Ensure national, regional and local issues are considered.
Q8	• Lack of resources resulting in unrealistic and unachievable targets. • LES may have no impact or little impact in relation to future targets. • Failure to monitor before and after implementation.	• Penalisation and other cost issues. Most have links to economic benefits. • Unattainable timescales and goals leading to a lack of achievement and poor delivery. • Uneven application of strategy. Must be applicable countrywide.	• Constancy across commercial and public sectors to ensure that there are no dis-benefits associated with the implementation of the strategy. • Disproportionate issues between rural and urban environments not taken into consideration. • People will continue to use cars.

The next table summarises the responses to the specific themed questions.

Edinburgh	P1	P2	P3
	• Development plans can guide integrated settlement and transport strategies. • Setting the legislative requirements and drivers for LES implementation and developers to follow. • Helps set and deliver specific goals through comprehensive guidance. • Place making should also address emissions through design solutions. • Refinement in order to link consenting regimes. • Improve adaptability of current systems to respond to requirements and improve	• Working patterns were considered in discussions in order to remove the need for travel. Recommendations included improved technology to encourage homeworking, video conferencing and employer consideration for flexible working to alter current rush hour	• Limited resources to absorb additional work requirements. • Planning has a long-term rather than short-term influence. • Current thresholds are not registering the creep in worsening air quality, preventing management and/or restricting methods. • Poorly integrated development driven by

	influence in the short-term. • Tougher policies to enforce action. • Modifications to ensure current local authority policies or those under development align the LES goals.	traffic trends. • At a larger, long-term scale, the use of the National Planning Framework, Strategic Development Plans, residential planning, travel plans and consideration of master plans were considered valuable in improving modal provisions and reducing the need for unnecessary travel. Buckinghamshire was given as a good example of how travel planning plays a role in reducing air quality.	market forces supporting the tragedy of the commons debate.
Glasgow	**B1**	**B2**	**B3**
	• Restricted and/or alternative delivery times. • Alternative delivery and distribution zones. • Use of rail freight. • Improved vehicle and fuel types.	• A lack of business case behind technological advancements due to the associated lag of economic benefits coming into effect post-investment. • Limited regulation. • Lack of reporting benefits associated with taking action. • Poor planning by big freight companies and their cliental. • Focused social and environmental goals. • Providing information for the positive, tangible financial benefits. This could include tax incentives, rewarding environmental certificates and incentives via funding. • Technological advancements. • Partnerships and shared facilities.	• Possible negative impacts of the LES include increased costs for businesses due to a disproportionate approach, poor timescales of delivery and/or penalisation. A large scale consideration of the strategy may reduce the competitiveness of smaller companies and/or local businesses in the area. A concentrated focus of the LES can also be considered to displace air quality issues to an alternative location. • An appropriate strategy that is proportionate to local issues considered. • The strategy should be monitored and managed appropriately. • Provide and promote positive, tangible financial benefits.
Stirling	**RE1**	**RE2**	**RE3**
	• Energy from waste. • Geothermal solutions at a number of locations. • Plasma gasification. • Windfarm. • Hydrogen technology • Biomass. • Solar or water power.	• Improved guidance and consideration of air quality in local development plans. • Build air quality incentives into renewable policies to establish joint thinking instead of a preference between the two.	It was considered that planning and planning policies have a crucial, driving role in the incorporation of renewable technologies in new developments. It was discussed that policies should include mandatory thresholds and/or requirements to this effect e.g. the Merton Rule, where developments are required to generate at least 10% of their

		• Direct links between air quality policy and other policy areas, with clear guidance on how air quality should be considered. • Increase the consideration of air quality in wider policies, such as, transport and regional development planning. • New developments must fully regard air quality issues and the use of renewable wherever possible. • A view of multiple benefits adds to a greater overall benefit.	energy needs from on-site renewable energy equipment[38]. It was considered important to recognise that not all types of renewables will be useful for all types of development. In addition, the use of thresholds and requirements which are consistent across Scotland is encouraged to maximise uptake and prevent over development within areas with lower thresholds.

At the Edinburgh and Glasgow workshops, a thought wall was provided allowing participants to record what they considered to be the three most important things to include in the Strategy. These comments are summarised in the following table.

Number 1	Number 2	Number 3
Edinburgh		
• Clear governance arrangements. • Planning on a human scale. • Mismatch between Scottish Government transport spending priorities and aspirations to reduce emissions. • Emphasise the economic benefits: reduced congestion; assisting economic development; smart mobility; and supports development of products and services (export opportunities). • Needs to have national, regional and local elements. • The strategy should provide a clear vision of purpose and objectives. • Work to reduce planners' love affair with big roads. • Buy in at the highest level regarding governance. • Both technological and behavioural change is needed to reduce emissions from transport. • It is not a competition. Road traffic accidents versus air quality deaths. Synergise the messages. • Consider……regulation. • Make links (if not already made) with air quality research network in Scotland. • Involve planners in the conversation. • Consider more regulation.	• Clear targets. • Sell the multiple benefits. • Don't reinvent the wheel. Use experience from elsewhere in developing the strategy. • Promote working from home worse for overall emissions in winter due to inefficiencies of heating many small places. • Must be centrally driven. • Encourage a modal shift to walking, cycling, public transport, zero emission vehicles. • Avoid travel e.g. working from home and using remote services such as NHS Highland Health. • Strategy should increase uptake of low emission vehicles and technologies. • Take a good look at what already exists. Streamline existing processes, remove conflicts and duplication. Align with legislation and guidance. Ramp up Wi-Fi feeds to South Korean levels.	• Meaningful and realistic measures. • Stick as well as carrot. • Need for sound evidence/collection of data to ensure well developed solutions. • Street trees and greening the urban landscape. • Trees must be used very carefully. Some species produce VOCs and can reduce wind speeds in streets. This traps pollution in the urban environment. • Link up with other strategies and approaches. Good places. Better health. Designing strategies. Place. Housing strategy. Physical activity. • Have clear air quality targets and accountability. • Measure in order to manage. • Transparency • No passing the buck between central and local authorities. • Have a no cars day. • Ultrafast broadband. • Strategy should align numerous pieces of legislation and guidance with common goals and objectives. • Introduce an electric car rally in Edinburgh. • Planning can help, but it is only one of the tools available. • Be careful not to overload expectations on a lot of planners.

[38] http://www.merton.gov.uk/environment/planning/planningpolicy/mertonrule.htm

		• Planners are not experts on emissions – specific and specialist knowledge must be sought. • Improve quality of information on arrival… in terms of future.
Glasgow		
• Need a level playing field. • Cost-benefit analysis of options for: large companies, small businesses, families, working age, retired/unemployed, cities, towns and rural areas • Needs to comply with EU/EC directives • Clear guidance and best practice for setup of an ultra LEZ to encourage political bravery. • Public transport and taxis are low emission vehicles (if used in city/town centres). • There needs to be a logical step process. Identify the issue, identify the source, develop appropriate measures. • Implement with national framework. • Monitor. Re-evaluate.	• Streamlining of strategies needed to combat 'policy fatigue' and a sense of added burden for local authority officers. • Realistic timescales for organisations to meet any targets. • Links to other initiatives e.g. healthy working lives, bike to work scheme etc. • National guidance on implementation process. Emission strategy not just delegated to local authority without cash or other incentives.	• Health risk/benefit analysis. E.g. air pollution risk for people with asthma, heart disease, pregnant women versus risk of obesity, days of sick etc. • Cross party consensus for brave political decision. • A national low emission zone would be preferable to local zones to prevent the displacement of the more polluting vehicles to outer suburban areas. • National, regional and local policy. Plan needs to look at and include all. • Opportunity to make Scotland an example in LES supported by local technologies, research and development. Political bravery and consensus to push forward any unpopular decisions.

Annex B – Low Emission Zone Guidance

B.1 Screening Assessment

The output of the screening assessment will be a short report to the Scottish Government confirming the findings. The assessment should be completed within 12 months of publication of this Strategy for existing AQMAs or declaration for new AQMAs. This assessment should also be used to determine whether an authority should consider an application to the Traffic Commissioner to have an emissions based Traffic Regulation Condition (TRC) attached to a public service vehicle operator licence or whether to develop emissions based Traffic Regulation Orders.

There is no automatic assumption in the screening procedure that the LEZ approach will be right for every situation. Rather, the procedure is designed to establish whether an LEZ is an appropriate tool for addressing poor air quality in a given local authority area or region. Should an authority or group of authorities decide, based on the screening conclusions, that an LEZ approach is worthy of further consideration, the national methodology set out below should be followed.

B.2 Evidence Gathering

The first stage of evidence gathering should be an initial assessment, the purpose of which is to quickly assess the potential benefits of a scheme. At a basic level, LEZs are intended to replace older vehicles with ones with more stringent emissions standards.

At the outset, it is important to define the area which would be covered by the LEZ. This will be determined by criteria such as the location and extent of AQMAs, and identification of vehicles types and classes which the scheme would target.

The initial assessment will involve the following:

- Define an area where an LEZ might operate. An LEZ is unlikely to be effective at a scale of single streets or junctions, and careful consideration is required at this initial stage;
- Identify those vehicle types and classes that the scheme would seek to regulate. Work undertaken to inform AQMA declaration should provide the basis of this information;
- Calculate or estimate the annual activity of those vehicle types within the chosen area. One way of estimating activity is to multiply traffic volumes by road link length and then to sum over all links in the area;
- Select a year in which the LEZ may become operational;
- Use an appropriate emissions factor methodology to obtain the year and vehicle type specific emission factors for NO_x and PM_{10} (g/veh km);
- Multiply activity by emission factor to estimate the baseline emissions; and
- Recalculate the product of the activity and the emission factors to estimate the annual emissions with the scheme in operation.

The difference from the baseline is the potential emissions benefit of the scheme.

This initial assessment will not address potentially important effects such as the redistribution of traffic and the contribution to emissions from congested conditions or from specific situations such as street canyons. This will require a detailed baseline emissions inventory. Local authorities may have already developed an emissions inventory as part of the action planning process. If not, the guidance (reference needed) should be followed. An inventory should be sufficiently detailed to allow the impacts of a range of potential policies to be assessed, accounting for:

- The impacts of Euro standards and other key policies on vehicle emissions;
- The impacts of local transport policy on traffic growth and other issues such as upcoming new developments;
- Road transport activity disaggregated by area and vehicle type, allowing the effects of policies that reduce activity, redistribute traffic or switch from one transport mode to another;
- Identification of which vehicles are spending the longest in the area under consideration;
- The contribution from stationary traffic, allowing policies that reduce congestion; and
- Fleet numbers and ages for key vehicle types, allowing the effects of policies to promote the uptake of newer vehicles.

Potential sources of data from which to develop emission inventories include road transport models, which can provide average speed and annual average daily flow data disaggregated by road link and usually split between light and heavy duty vehicles. More detailed surveys can be used to distinguish between buses and heavy goods vehicles. Furthermore, some traffic models also provide link specific data on the daily average time that traffic is stationary at junctions and the average length of these queues. These data are necessary to estimate the potential contribution from congestion. Also of use is the emissions factor toolkit which allows calculation of road traffic exhaust emissions for different vehicle categories and splits, at various speeds, and on different road types, besides calculating emission factors in future years.

In the case of individual fleets (such as the local authority's own fleet or commercially operating bus fleets) a specific fleet inventory should be developed, as the distribution of vehicle ages within these fleets can typically vary quite significantly from the national average. Key information will be the age and abatement equipment of each vehicle. The methods to be used in these assessments are provided in detail in the LAQM technical guidance TG(09)[39].

A basic cost benefit analysis[40] will also be required at this stage.

B.3 Feasibility Study

The information obtained from the screening assessment and feasibility study will form the basis for a decision on how an LEZ should be implemented in a given area. For example, the emissions inventory, vehicle activity information and fleet profile analysis will indicate the vehicle types and classes which should be targeted as priority in a particular LEZ. The appropriate vehicles will be specific to local

[39] http://www.scotland.gov.uk/Resource/Doc/211199/0078277.pdf
[40] https://www.gov.uk/air-quality-economic-analysis

circumstances, and could cover cars, buses, taxis, HGVs, LGVs, or a combination of these. In defining the scheme a report should be provided using the standard criteria shown in the table 3 below. This framework provides the structure for any LEZ established in Scotland.

The output from the feasibility study will be a report to the Scottish Government which outlines how the LEZ will be created and implemented; as a minimum, it should incorporate the criteria listed in Table 3. The report should be submitted no later than 12 months after submission of the screening report.

Criteria	Detail
Legal basis	The legal supporting measures for managing vehicles in the LEZ.
Equipment	Engine standards and retrofitted equipment that will be driven by LEZ implementation.
Certification Process	The technology and methodology used to manage and deliver the scheme
Exclusions & alternative approaches	A description of the implementation programme, stakeholder engagement, including a list of groups and vehicles excluded from the LEZ restrictions.
Monitoring process	How the LEZ will be managed on a daily basis.
Communication	Pre-implementation communication
Implementation	Post-implementation phasing.
Cost Benefit Analysis	A detailed cost benefit analysis of the LEZ and a description of the before and after monitoring process.

Table 3 – Guidance criteria for an LEZ

Legal basis

Local authorities may establish an LEZ by making a Traffic Regulation Order (TRO) under the Road Traffic Regulation Act 1984 and associated regulations. If the LEZ is focusing on buses, an alternative approach could be to ask the Traffic Commissioner to attach a Traffic Regulation Condition based on emissions standards to a bus operator's licence using powers in the Public Service Vehicles (Traffic Regulation Conditions) Amendment (Scotland) Regulations 2008[41]. Authorities will have already determined during the screening assessment whether such an approach would be appropriate for their circumstances. More detailed guidance on how to make an application to the Traffic Commissioner has been prepared by the Scottish Government[42].

Emissions standards

For new diesel vehicles, the standard should be Euro VI. Earlier Euro class vehicles must be retrofitted with emissions reducing equipment to bring them as near to Euro VI as possible.

[41] http://www.opsi.gov.uk/legislation/scotland/ssi2008/pdf/ssi_20080002_en.pdf
[42] http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Pollution-1/16215/7608

Equipment

Retrofitted technology must reduce emissions of both NO_x and PM. Only equipment which is listed on the Scottish Government's Emissions Reduction Register[43] may be fitted to vehicles which are to enter the LEZ. Local authorities should ensure that vehicle owners and operators are aware of this requirement and undertake suitable checks to ensure compliance.

Certification

Certification will be based on the new International Standards Organisation (ISO) standards for NO_2 and PM_{10}, currently in development[44].

Alternative approaches

Depending on the conclusions from the evidence gathering exercise, local authorities may decide that exclusion of entire vehicle classes and types from the LEZ may be neither cost effective nor achieve the required aims for reducing emissions. In such cases, the authority may select from one or more of the following approaches, provided it is justified by the evidence. These approaches could also be used for some vehicle classes and types in conjunction with full exclusion for others.

- Worst X% of buses, taxis, HGVs or LGVs to be targeted*;
- X% of diesel vehicles to be replaced by petrol or low/zero emission vehicles entering the LEZ;
- X% reduction in freight movements within the LEZ;
- X% reduction in car numbers entering the LEZ.

Where X is determined on the basis of the evidence gathered.

Local authorities may also consider similar targets, but these should submitted to the Scottish Government for approval before being adopted.

Economic Analysis

An economic analysis of the potential impact of an LEZ will need to be undertaken, using the guidance prepared by the Interdepartmental Group on Costs and Benefits (IGCB) for the UK administrations[45]

Vehicle detection and enforcement

Confirmation that a vehicle complies with LEZ criteria could be via a paper permit, windscreen sticker, the Vehicle Registration Mark (VRM) on the number plate, or by self identification using a transponder or smart card. Detection of a vehicle's emission status when entering or operating within an LEZ could be carried out by a variety of methods.

[43] http://tools.energysavingtrust.org.uk/scotland/Organisations/Transport/Scottish-Government-Emissions-Reduction-Register
[44] http://www.iso.org/iso/home.htm
[45] https://www.gov.uk/air-quality-economic-analysis

Manual methods usually involve enforcement personnel visually checking vehicles travelling within or parked within the scheme area for identification marks (VRM and/or a permit/sticker). In existing LEZs in Europe, checks generally focus on older looking vehicles and might use a mixture of manual recording and possibly photography. Some post checking against a database of compliant vehicles is usually necessary.

Digital cameras and ANPR (automatic number plate recognition) record passing number plates and use optical character recognition (OCR) for matching against a vehicle database. A network of cameras can be installed on the key routes in and out of the LEZ and possibly at key junctions within the zone if it is large. ANPR cameras are able to capture 90%+ of passing number plates. Mobile ANPR cameras can also be used to monitor key junctions and/or hotspots.
Dedicated Short Range Communication (DSRC) tags and beacons are more suitable for schemes with relatively few and/or predetermined users. Tags or proximity smartcards are commonly issued to vehicle owners for accessing private car parks, or can be scanned through a windscreen, and can also be used to trigger bollards which control access on public roads.

The benefits of manual detection methods are lower capital costs and some flexibility over future operating costs if enforcement levels can be reduced. Manual enforcement is suitable for parking schemes, whether on street parking or development sites. A drawback of manual enforcement is the limit on the number and speed of vehicles that can be checked. However, evidence from existing schemes shows this approach should not be ruled out.
The benefits of automated enforcement systems are that high speed and volume flows of vehicles can be detected and recorded, and that every vehicle can be checked. Drawbacks can include the relative inflexibility of fixed camera systems once they are installed, and the upfront capital costs.
Based on the above considerations, the Scottish Government proposes that a manual enforcement scheme will be employed, based on the German sticker system. A local authority could add compliance monitoring to the existing duties of traffic wardens. In cases of non compliance, a similar approach non payment of parking charges would be appropriate i.e. a fixed penalty notice.

B.4 Implementing

It is vital to the potential success of an LEZ that affected vehicle owners and operators are given sufficient notice to ensure compliance before the LEZ is established. This should be a minimum of one and maximum of two years following the initial announcement. Once the LEZ is in place, phased implementation may be considered depending on local circumstances. However, a long lead in time for full compliance will reduce the impact of the LEZ. Effectiveness may also be reduced if an unrealistically short timescale results in temporary exemptions being required. Careful selection of milestones in any phased implementation is therefore very important.

Good publicity is also critical. Local authorities will need a solid evidence base for any decision to implement an LEZ and this must be translated into a clear and effective communications strategy targeted at both vehicle owners and operators

and the general public. Acceptance of the LEZ is likely to be greater if the health and environmental benefits are emphasised alongside the more technical emissions reduction and legislation compliance justifications. Acceptance will also be enhanced if the rules are clear, simple and effective. A great deal of useful information relating to LEZ implementation can be found on the Low Emission Hub[46].

B.5 Managing and Monitoring

Post implementation monitoring of progress within an LEZ is another essential element. This could include:

- Ongoing or specific monitoring of pollutant concentrations;
- Further source apportionment to help link any identified concentration reductions to the LEZ;
- Assessment of progress towards any milestones e.g. in terms of phased implementation or percentage targets;
- Effectiveness of compliance assessment strategy;
- Statistical procedures e.g. to remove influence of variability from non-local sources.

In summary, the success or otherwise of an LEZ will largely depend on:

- Good quality evidence gathering in the assessment phase;
- Clear aims i.e. is the priority legislative compliance, the best cost benefit outcome, improved health, a more pleasant urban environment etc.;
- Identifying and targeting the most important sources first;
- Consideration of whether entire vehicle types or classes, the most polluting percentage of a type/class, or a combination of these approaches is required;
- Adopting a scheme which is most appropriate for local circumstances;
- A good communications strategy;
- Clear and simple rules;
- Sufficient lead in time before implementation;
- Defined milestones which are neither too challenging or undemanding;
- Strong enforcement, and penalties;
- Effective post implementation monitoring of compliance and progress towards targets;
- Complementary measures – an LEZ is unlikely on its own to achieve all of the emissions reduction targets in a particular area.

[46] http://www.lowemissionhub.org/about/

Annex C - Modelling Guidance

Further detail on the national air quality modelling approach including governance, and examples. This section is still under development and will be included in the final version of the Low Emission Strategy.

Annex D - Useful Resources

D.1 – Key air pollutants, sources and effects

Pollutant	Sources	Effects
Particulate matter (PM_{10} and $PM_{2.5}$)	PM is made up of a wide range of substances and comes from a variety of sources. PM comprises primary particles emitted directly into the atmosphere and secondary particles formed by chemical reactions in the atmosphere (between NO_x, SO_x, NH_3 and organic substances). The biggest sources of primary PM are from combustion activities including emissions from transport, ships, power generation and households. Transport can also give rise to non-combustion sources through tyre, break and road wear. Other sources of PM include quarrying, agriculture, construction and natural sources such as sea salt and wind-blown dust.	Exposure to PM (in both the short and long-term) is associated with respiratory and cardiovascular health impacts. These are especially significant for susceptible members of society (such as the young, elderly and those with pre-existing health conditions). PM can carry surface-absorbed carcinogens into the lungs. There is currently no safe threshold concentration for exposure to PM. A component of PM can be black carbon (BC) which contributes to global warming.
Oxides of nitrogen (NO_x)	Oxides of nitrogen (NO_x) are produced during combustion activities in the presence of air and are a mixture of nitrogen dioxide (NO_2) and nitric oxide (NO). The biggest sources of NO_x are from transport activities (exhaust gases), power generation, industry and households (e.g. gas-fired cooking).	NO_2 at high concentrations can cause respiratory health impacts (such as inflammation of airways and lungs, reduced lung function, reduced resistance to respiratory infections and exacerbation of pre-existing health conditions). NO_x contributes to the formation of secondary PM and O_3 which also have health impacts. NO_x is a contributor to acid rain, and the acidification and nitrogen enrichment of sensitive habitats. High levels of NO_X can also have an impact on vegetation, including damage to foliage and reduced growth rates. NO_x can cause damage to buildings and infrastructure.
Sulphur dioxide (SO_2)	SO_2 emissions arise mostly from power generation, the combustion of sulphur-containing fuels (such as oil and coal) and from industry (e.g. petroleum refineries).	SO_2 can cause respiratory health impacts such as constriction and irritation of the airways and exacerbation of pre-existing health conditions such as asthma. SO_2 contributes to the formation of secondary PM and will have associated PM health impacts. SO_2 is a contributor to acid rain, and the acidification of sensitive habitats. SO_2 can cause damage to buildings and infrastructure.
Ozone (O_3)	O_3 is a secondary pollutant produced by chemical reactions in the atmosphere between NO_x, NMVOCS and sunlight (O_3 is not released as a primary pollutant from human activities).	O_3 at high concentrations can cause respiratory health impacts (such as inflammation/irritation of airways, reduced lung function and exacerbation of pre-existing health conditions). O_3 can also cause irritation of the eyes O_3 causes damage to vegetation resulting in reduced crop quality and yield and reduced biodiversity. O_3 can cause damage to buildings and infrastructure. O_3 is a greenhouse gas (GHG) which contributes to global warming.
Carbon monoxide (CO)	CO is formed from the incomplete combustion of	CO can reduce the capacity of blood to

	fuels. The largest source is transport, with residential and industrial fuel burning also contributing.	carry oxygen. This can cause health impacts in people with pre-existing health conditions. At very high concentrations CO can lead to death. CO also contributes to the formation of O_3.
Benzene (C_6H_6)	C_6H_6 emissions arise mostly from transport, industry and the combustion of fuels.	C_6H_6 is a carcinogen which attacks genetic material. There is currently no safe threshold concentration for exposure to C_6H_6. C_6H_6 is also a NMVOC and contributes to the formation of O_3.
Non-methane volatile organic compounds (NMVOCs)	NMVOCs arise from the use of solvents in industry, road vehicles, household heating and products and power generation.	NMVOCs are a key component in the formation of O_3.
1,3-butadiene	1,3-butadiene arises mostly from the combustion of petrol in vehicles but also from industrial activities.	1,3-butadiene is a carcinogen which attacks genetic material. There is currently no safe threshold concentration for exposure to 1,3-butadiene. C_6H_6 is also a NMVOC and contributes to the formation of O_3.
Polycyclic aromatic hydrocarbons (PAHs)	PAHs are a family of pollutants which can arise from many sources. The main sources are combustion of fossil fuels and industrial activities. The mixture of PAHs produced depends on the mode of combustion. PAHs are also produced naturally via forest/wild fires. In Scotland benzo[a]pyrene (B[a]P) is used as a marker for PAHs as it is considered one of the most dangerous of the family.	As PAHs are individually different it can be difficult to assess their health impacts. Several PAHs are thought to cause cancer, including B[a]P. Individual PAHs vary in their toxicity depending upon their structure and for some this is still is unknown or uncertain. PAHs can make up a component of PM emissions.
Carbon dioxide (CO_2)	The main source of CO_2 from human activities is the combustion of fossil fuels.	CO2 released to the environment from combustion activities will not be in a concentration high enough to cause health impacts. CO_2 is a powerful GHG and contribute significantly to global warming.
Ammonia (NH_3)	NH_3 mostly arises from agricultural activities such as fertilisation of crops and animal waste products (slurry, manure). Smaller sources of NH_3 include	NH_3 is a contributor to the acidification and nitrogen enrichment of sensitive habitats. NH_3 contributes to the formation of secondary PM and will have associated PM health impacts.

D.2 – Factors contributing to poor air quality and potential solutions

The following table describes the main factors which contribute to poor air quality, what leads to their contribution and potential measures which could be put in place to mitigate their impact. The factors, their contribution and measures are generic in nature. These are included for illustrative purposes only and any particular factor which contributes to poor air quality will need to be investigated on a site-specific basis to determine the measures (or suite of measures) which are most appropriate to the situation. In many cases this will be carried out through the local air quality management process or via the implementation of policy at a variety of levels.

Contributing factor to poor air quality	How does this contribute to poor air quality?	Potential solutions
Street Canyons	• Street canyons trap pollutants at ground level and maximise exposure. • Pollutants are recycled when orientation of street if perpendicular to the prevailing wind (levels of pollution are higher on the leeward side of street). • Levels can also build up very rapidly during period of calm conditions. This can be a serious problem in cities, where there is evidence to show that such conditions can lead to a rapid build-up in fine particulate matter that can last for days. • Street canyons are often utilised by buses and taxis. • Effects are increased when buildings on one side are higher than those on the other.	Restrict, reduce or otherwise control access of older, more polluting vehicles to problem areas; particularly buses and HGVs as they can emit disproportionately higher levels of atmospheric pollutants. Reduce volume of traffic especially passing through street canyons. Reduce number of older buses by upgrading to higher Euro Standards/retrofitting/using alternative fuels. Prevent standing traffic from queuing in street canyons. Revisit existing traffic management solutions or introduce new traffic management IT solutions to optimise traffic flow. Restrict parking availability to reduce private vehicle use in urban centres or reconsider parking charging regime. Introduction of traffic free zones and pedestrian areas. Use of ring roads and bypasses. Prevent traffic from entering urban centres during periods of calm conditions when pollution levels increase and less dispersion of pollutants occurs. City centre air quality monitors can be linked to road traffic signs advising motorists of high levels of pollution. Penalising of poor driving practices (e.g. automated fines for illegally entering box junctions).
Volume of traffic and congestion	• Increase in the number of registered vehicles requiring use of relatively static road space. • Measures to smooth traffic flow at one location can cause congestion at nearby locations. . • Slow-moving, congested traffic generates more emissions. • Air pollution is considerably worse in street canyons where traffic counts demonstrate high volumes of traffic in comparison to other city spaces. • Inefficient traffic management at nodes such as traffic lights or, roundabouts to cope with increasing traffic volume, as listed below in more detail. • Traffic is second fastest growing source of CO_2. • Every petrol/diesel vehicle emits CO_2 as well as air pollutants.	
Traffic control and junctions	• Vehicles accelerating from a standstill can emit far higher levels of pollution (may also include unburnt hydrocarbons – not currently measured). • Street canyons can exacerbate the situation. • High levels of pollution may exist in the vicinity of busy bus stops, taxi ranks. • Particulates emitting during braking. • Poor driving practices can result in congestion at junctions (e.g. illegal entry of box junctions). • Traffic flow priorities may not be optimised, resulting in unnecessary standing traffic.	
Buses	• Older buses emit disproportionately high levels of pollutants and they have been highlighted as a key polluter in many areas. • Buses can account for a lower proportion of traffic compared to their contribution to NO_x emissions. • AQMAs have often been designated along, or incorporate busy bus routes. • Alternative bus routes are not often considered, particularly for routes which contribute to existing AQMA	Older vehicles can be prohibited from entering areas of poor air quality. These older buses can be routed to outlying areas, provided that this doesn't simply result in shifting the problem elsewhere. Retrofit older buses to a higher Euro Standard. Introduce new Euro 6 Standard buses. Use buses with alternative fuel technologies (biofuels, hydrogen, electric).

	designation. • Deregulation of bus operators resulting in limited control of bus fleet (and emissions control). • Challenging business case to investment in new buses or retrofit existing buses in order to reduce emissions in AQMAs.	Encourage and incentivise bus operators to invest in new vehicles and technology.
Diesel mix of vehicle fleet	• The number of diesel powered vehicles has increased significantly over the last 10 years. • They are seen to be a greener alternative, compared to petrol, due to better mileage per gallon and lower CO_2 emissions. • New Euro standard technology has driven down emissions of PM but emissions of NO_2 have increased significantly. • The UK VED system has encouraged diesel uptake, as the VED is based on CO_2 emissions and diesels emit lower levels of CO_2 than petrol. • Diesel emissions are more harmful than petrol emissions. The WHO has recently classified diesel emissions as carcinogens[47]. Fine particulates are harmful to human health.	Access of diesel-powered vehicles could be restricted or otherwise controlled in problem areas. The public and businesses should be provided with detailed information on the pros and cons of petrol vs. diesel vehicles, allowing them to make fully informed purchasing and usage decisions. Where diesels are used they should be of the highest Euro standard possible.
Heavy Good Vehicles (HGVs)	• HGVs can account for a lower proportion of traffic compared to their contribution to emissions. • HGVs have been highlighted as a key polluter in several LAQM reports. • Many LEZs elsewhere in Europe have banned early Euro Standard vehicles from entering urban centres. This works well for PM, but has not been so effective in the case of NO_2.	LEZs would help to limit the number of older vehicles from entering polluted areas and also accelerate the uptake of new technologies. Use highest available Euro standards. Voluntary freight partnerships could help to educate freight operators and encourage uptake of new technologies.
Cars	• The number of registered road vehicles has almost doubled in Scotland since 1975[48]. • Society is heavily dependent on private car use. • Some developments are only viable because people have access to cars and travel plan make not be effective. Travel plans are produced, but not enforced. • Out-of-town retail and commercial developments encourage car use. • Pressure to provide more housing is seeing developments that are located away from employment, retail and schools – forcing people to travel. • High volumes of traffic entering/leaving urban areas at the same time may result in congestion and high levels of pollution.	Support the decarbonisation of our transport fleet, initially through the uptake of plug-in electric and hybrid vehicles. People travel considerable distances to shop in supermarkets and out-of-town retail outlets, rather than utilising town centres. Support the rejuvenation of town centres and encourage their repopulation/re-use. Identify examples where they have thrived. Champion a travel hierarchy which encourages the reduction of, or the need to, travel. Investigate the potential benefits of low emission zones. Develop integrated public transport systems that are both financially and operationally attractive to the public.
Resuspension of particulates	• Resuspension of materials from brake and tyre wear. • Resuspension of materials deposited onto road surfaces (e.g. mud, aggregates).	Ensure roads are kept clean. Technologies available to fix materials to the road. Ensure vehicles leaving sites are suitably cleaned and operated (e.g. wheel-washes, sheeted vehicles, low vehicle speeds).

[47] http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf
[48] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendMotorVehicles

Out of town development	• Out-of-town residential development, retail parks and commercial parks have encouraged private car use. • Residential estates are being built in locations that are distant from areas of work and amenities (such as shops, doctors, schools, leisure etc.) and/or public transport links. • People commute considerable distances, adding to emissions of air pollutants and greenhouse gases.	Need to rejuvenate town centres and encourage the population to return to them. The planning system needs to be used more effectively to provide controls on developments which may create, or exacerbate, air quality problems.
Geography	• Steep inclines on streets likely to increase emissions. • Prevailing weather conditions. • Vehicles inappropriately routed in urban centres (e.g. HGVs).	Re-route vehicles such as buses and HGVs off routes with steep inclines or via out of town routes.
Background sources (PM_{10} only)	• Makes complying with air quality objectives and limits more difficult. • Harder to reduce pollution levels through local actions alone (could be regional or transboundary inputs).	Difficult to control as unpredictable and mostly natural sources such as sea salt, dust (from agricultural sources), accidental fires, natural fires, volcanic activity, etc.

D.3 – Key issues associated with local authority Air Quality Management Areas

Local authority	Volume of traffic and congestion	Traffic control s and junctions	Street Canyons	Buses	Diesel mix of vehicle fleet	HGVs	Cars	Out of town development	Geography	Background	Other
Aberdeen											
• City Centre	X	X	X	X	X		X			X	
• Wellington Road	X	X			X	X			X	X	
• Anderson Drive	X	X	X		X		X			X	
East Dunbartonshire											
• Bishopbriggs	X	X									
• Bearsden	X	X									
Glasgow											
• City Centre (1)	X	X	X	X	X	X	X				
• City Centre (2)											
• Byres Road	X	X	X	X							
• Parkhead Cross	X	X		X				X			
North Lanarkshire											
• Motherwell	X	X		X	X						
• Chapelhall	X	X		X	X						
• Whifflet	X	X		X	X						
• Croy	X				X		X		X		
• Moodiesburn	X			X							
Renfrewshire											
• Paisley Centre	X	X		X	X	X					
South Lanarkshire											
• Whirlies Roundabout – East Kilbride	X	X									
East Lothian											
• Musselburgh High Street	X	X		X							
Edinburgh											
• City Centre	X	X	X	X	X						
• St John's Road	X	X	X	X	X		X				
• Great Junction Street	X	X	X		X		X				
• Glasgow Road					X		X				
• Inverleith Road	X	X			X		X				

Local authority	Volume of traffic and congestion	Traffic control s and junctions	Street Canyons	Buses	Diesel mix of vehicle fleet	HGVs	Cars	Out of town development	Geography	Background	Other
Fife											
• **Appin Crescent - Dunfermline**	X	X		X	X	X	X			X	
West Lothian											
• **Broxburn**	X	X					X			X	
Dundee											
• **Dundee City**	X	X	X	X	X		X		X	X	
Fife											
• **Cupar**	X	X	X		X		X				
Perth and Kinross											
• **Perth**	X	X	X		X					X	
• **Crieff High Street**	X	X	X		X				X	X	
Falkirk											
• **Banknock/Haggs**	X										
• **Falkirk Town**	X	X	X		X						
• **Banknock**					X					X	X[49]
• **Grangemouth**											X[50]
Highland											
• **Inverness**	X	X	X								

[49] Due to resuspension of material deposited on roads due to quarrying activities.

[50] Due to activities at the industrial complex at Grangemouth.

Annex E – Legislation and policy – Europe, UK and Scotland

Legislation and policy relating to emissions to air			
Legislation	**Key requirement(s)**	**Policy outcome(s)**	**Relationship to LES**
Europe			
Directive 2001/81/EC on National Emissions Ceilings (currently under review)	• Sets national emissions ceilings for certain pollutants. • Emissions reductions programmes	Abatement of acidification, eutrophication and ground-level ozone and their impacts on habitats and health-based exposure.	The LES will contribute to complying with this Directive.
Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air	• Sets target values for substances. • Monitoring, modelling requirements are defined. • Making information available to the public.	Protect human health and the environment. This will eventually be subsumed into Directive 2008/50/EC.	The LES will contribute to complying with this Directive.
Directive 2008/50/EC on ambient air quality and cleaner air for Europe	• Definition and fixing of objectives for air quality. • Setting of limit values and/or alert thresholds (and/or target values for ozone) for several pollutants of concern for human and environmental health. • Assessing air quality according to a clearly defined methodology. • Making information available to the public. • Maintaining or improving ambient air quality.	Protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.	Compliance is legally binding on the UK as an EU Member State. The LES will be a key delivery mechanism for complying with the Directive requirements.
Directive 2010/75/EC on industrial emissions	• Updates the IPPC Directive controlling emissions from industrial activities. • Brings together seven existing Directives into one legal instrument.	To protect human health and the environment from emissions from large-scale industrial activities and contribute to complying with the NECD.	The LES will look to control emissions which may not be controlled via permitting (e.g. transport).
United Kingdom			
Environment Act 1995	• Sets the legislative framework for Local Air Quality Management.	Contains a requirement for central government to produce a national Air Quality Strategy. Sets out procedures and obligations on local authorities in relation to Local Air Quality Management.	The LES will contribute to fulfilling the requirements of Local Air Quality Management.
Clean Air Act 1993 (currently under review)	• Controls emissions of smoke, grit, dust and fumes from domestic and industrial processes.	Currently a potential policy conflict between the promotion of biomass combustion and local air pollution impacts.	The LES will contribute to fulfilling the requirements of the Clean Air Act and reducing the impacts of biomass combustion.
Scotland			
Air Quality (Scotland) Regulations 2000	• Sets objectives for several pollutants of concern for human and environmental health (NO_2, SO_2, PM10, benzene, 1,3-butadiene, CO, Pb, PAH and O_3).	Contributes to achieving the policy aims of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland.	The LES will be a key delivery mechanism for complying with the Regulations.
Air Quality (Scotland) Amendment Regulations 2002	• Prescribes tighter objectives for benzene, PM and CO.	Contributes to achieving the policy aims of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland.	The LES will be a key delivery mechanism for complying with the Regulations.
Air Quality Standards (Scotland) Regulations	• Require assessment of air quality in accordance with	Provides the framework and process for meeting	The LES will be a key delivery mechanism for

2010	Directive 2008/50/EC. • Ensure compliance with EU limit values (and no increase in levels of pollutants where already met). • Air quality action planning. • Public access to information. • Annual reporting. • New limit values and exposure reduction targets for PM2.5	EU compliance. Contributes to achieving the policy aims of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland.	complying with the Regulations.
The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations 2003	• Optional powers for local authorities to undertake roadside vehicle emissions testing. • Optional powers for local authorities to request drivers of parked idling vehicles to switch off their engines. • Powers to issue fixed penalty notices for non-compliance.	Contributes to achieving the policy aims of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland.	one of a range of existing measures that will support delivery of the LES aims.
Pollution Prevention and Control (Scotland) Regulations 2012	• Updates previous PPC Regulations to transpose requirements of IED. • Provides system of permitting industrial activities. • Controls emissions from smaller-scale industrial activities.	To protect human health and the environment from emissions from industrial activities.	The LES will look to control emissions which may not be controlled via permitting (e.g. transport).
Air quality policy/guidance	**Key requirement/content(s)**	**Policy outcome(s)**	**Relationship to LES**
Fine particulate matter (PM2.5) in the UK, Air Quality Expert Group (AQEG) 2012	• Challenges the robustness of the evidence for making future policy decisions in respect of $PM_{2.5}$ in the UK context. • Analysis of the evidence concerning key aspects including $PM_{2.5}$ measurement and the composition and current concentrations of $PM_{2.5}$ across the UK. • Source emissions and receptor modelling for $PM_{2.5}$. • Evaluates the methods for modelling $PM_{2.5}$ and what can be said about future concentrations. Assessment of the key uncertainties and gaps in the evidence base that require action.	To increase the evidence base in relation to $PM_{2.5}$ emissions and inform future government policy direction.	Will inform the measures and actions suggested in the LES.
Road transport biofuels: Impact on UK air quality, AQEG 2011	• Assesses biofuel consumption in the UK (trends, types, composition). • Effects of biofuels on vehicle emissions. • Effects of biofuels on air quality. • Current trends and potential future impacts.	To increase the evidence base in relation to biofuel uptake and AQ emissions and inform future government policy direction.	Will inform the measures and actions suggested in the LES.
Ozone in the United Kingdom, AQEG 2009	• Assesses trends and distribution of O_3 concentrations from O_3 monitoring. • Assesses trends in background O_3 concentrations. • Impacts of O_3 on climate change. • Likely future trends of O_3. • Impacts of European emissions on the UK	To increase the evidence base in relation to O_3 emissions and inform future government policy direction.	Will inform the measures and actions suggested in the LES.

	• Control options for exposure reduction to O_3.		
Trends in primary nitrogen dioxide in the UK, AQEG 2007	• Assesses trends in NO_2 emissions for the UK. • Looks at sources, influencing factors, and explains the relationships. • AQ modelling and interpretation of data.	To increase the evidence base in relation to NO_2 emissions and inform future government policy direction.	Will inform the measures and actions suggested in the LES.
Particulate matter in the UK, AQEG 2005	• Looks at PM composition, sources, health impacts, monitoring methods. • Assessment of monitoring data. • Trends in PM emissions in the UK. • Recommendations o monitoring, modelling, emissions factors and next steps.	To increase the evidence base in relation to PM emissions and inform future government policy direction.	
The revised air quality strategy (AQS) for England, Scotland, Wales and Northern Ireland 2007 Volume I & Volume II, UK Government and the devolved administrations 2007	• Objectives set for main AQ pollutants. • Exposure reduction approach to reduce emissions of certain pollutants. • Assessment of air quality. • Sets government policy objectives and measures to achieve these. • Describes how other sectors can help achieve government objectives.	Sets out air quality objectives and policy options to further improve air quality in the UK from today into the long-term. Underpins and provides the basis for all the domestic legislation on AQ.	The LES will link directly to the policy objectives of the AQS and will assist in delivery.
Local Air Quality Management Policy Guidance PG(S)09, Scottish Government 2009	• Sets out the procedures for Local Air Quality Management. • Describes how local authorities should handle the designation of Air Quality Management Areas (AQMAs) and the drawing up and implementation of action plans. • Provides suggestions for taking forward the development of local AQ strategies, how LAs should consult and liaise with others; • Describes the general principles behind air quality and land use planning.	Provides guidance for the delivery of the AQS and compliance with the various legislation.	The LES will compliment PG(S)09 by providing a more integrated approach for LAs dealing with AQ.
Local Air Quality Management Technical Guidance TG(S)09, UK Government and devolved administrations 2009	• Provides detailed guidance on the review and assessment process. • Provides detailed technical guidance on aspects such as monitoring, modelling, tools and methodologies.	Provides technical guidance for the delivery of the AQS and compliance with the various legislation.	The LES will compliment TG(S)09 by providing a more integrated approach for LAs dealing with AQ.
PM2.5 concentrations, sources, and regulatory impacts of new policy framework, Sniffer 2011	Findings in relation to: • Sources and behaviour of $PM_{2.5}$. • Exposure to $PM_{2.5}$. • Human health effects of $PM_{2.5}$. • Legislation to control $PM_{2.5}$.	All interested parties should further research $PM_{2.5}$ to develop a better, more comprehensive, shared understanding of PM2.5 sources and	

		concentrations so that appropriate, scientifically-based control strategies can be developed.	

Health		
Europe	**Key finding(s)/content**	**Policy outcome(s)**
Review of evidence on health aspects of air pollution (REVIHAAP), WHO 2013	• A considerable amount of new information on effects on health of NO_2, PM and O_3 has been published since 2005. • Review confirms the scientific conclusions of the WHO air quality guidelines global update (2005). • The effects of pollutants may occur at concentrations lower than the values determined in 2005.	The REVIHAAP review was commissioned by the European Commission as part of its review of AQ policy and legislation carried out in 2013. The Clean Air Package for Europe relies on REVIHAAP to provide the basis, evidence and justification for development of EU air quality policy until 2030.
Health risks of air pollution in Europe (HRAPIE), WHO 2013	• The general categories of road traffic, space heating and air conditioning and shipping are the 3 main emission sources associated with emerging issues for health. • Fine and ultra-fine particles and their metal content are of greatest concern in relation to health impacts. • Some of the issues identified are not new but may not have been sufficiently recognized or given priority in the past, while their significance or importance is now coming to the fore. • Many well-known issues still require attention. • Generally consistent with the findings of the REVIHAAP evidence review.	
Air quality guidelines. Global update 2005. Particulate matter, ozone, nitrogen dioxide and sulfur dioxide, WHO 2006	• Offers guidance on reducing the effects on health of air pollution. • Revised guideline values (and rationale/evidence) for the four most common air pollutants (PM, O3, NO2, SO2) based on a review of the accumulated scientific evidence. • Review of the issues affecting the application of the guidelines in risk assessment and policy development.	The EC review of AQ policy and legislation has stated these will at least provide the baseline for further development of EU AQ values from 2025 and beyond. Further work may bring these guideline values down further based on knowledge at the time. This document tightens the guideline values from the WHO 1987 and 2000 publications (see below).
Air quality guidelines for Europe (2nd Edition), WHO 2000	• Provides the basis for protecting public health from adverse effects of air pollutants. • To eliminate or reduce exposure to those pollutants that are known or likely to be hazardous to human health or wellbeing. • Provide background information and guidance to authorities in making risk assessment and risk management decisions. • Provide the basis for setting standards or limit values for air pollutants (including origin and methodologies for the guidelines).	This document and its predecessor (1st edition published in 1987) provide the basis for current EU (and therefore Scottish) standards and limit values for the air pollutants of most concern to human health.
UK	**Key finding(s)/content**	**Policy outcome(s)**
Estimating local mortality burdens associated with particulate air pollution, Public Health England 2014	• Estimates of the size of the effect of air pollution on mortality in LA areas in the UK. • Discusses the concepts and assumptions underlying the calculations and gives information on how such estimates can be made.	The estimates are expected to be useful to health and wellbeing boards when assessing local public health priorities, as well as to others working in the field of air quality and public health.
Review of the air quality index, COMEAP 2012	• The report provided the basis for updating the UK AQ index based on new	The Index provides information on levels of air pollution to the public, to allow the susceptible

	research, developments in the regulation of AQ and public communications research	members of society to take action to avoid adverse health impacts. This built upon the existing UK AQ index and was adopted by the Scottish Government.
The mortality effects of long-term exposure to particulate air pollution in the UK, COMEAP 2010	• Removing all anthropogenic PM air pollution (measured as $PM_{2.5}$) could save the UK population approximately 36.5 million life years over the next 100 years. • Would be associated with an increase in UK life expectancy from birth, i.e. on average across new births, of six months. • A policy which aimed to reduce the annual average concentration of $PM_{2.5}$ by 1 $\mu g/m^3$ would result in a saving of approximately 4 million life years or an increase in life expectancy of 20 days in people born in 2008. • The current (2008) burden of anthropogenic particulate matter air pollution is, with some simplifying assumptions, an effect on mortality in 2008 equivalent $PM_{2.5}$ to nearly 29,000 deaths in the UK at typical ages and an associated loss of total population life of 340,000 life-years.	The report is used to inform UK and DA Government policy in relation to AQ.
Long-term exposure to air pollution: effect on mortality, COMEAP 2009	• Air pollution has a greater effect on mortality in the UK than previously thought, with a 10µg/ m^3 increase in fine PM being associated with a 6% increase in risk of death from all-causes. • Exposure to SO_2, NO_2, CO and O_3 on mortality is also discussed but evidence is felt to be weaker than that regarding PM.	The report is used to inform UK and DA Government policy in relation to health and AQ.
Cardiovascular disease and air pollution, COMEAP 2006	• Daily variations in concentrations of several air pollutants and long-term average concentrations of fine PM, SO3 and SO2 are associated with a range of effects on the cardiovascular system. • The impacts on public health implied by these associations, though not as large as those arising from factors such as family history, active smoking and hypertension, are important and that a precautionary approach should be adopted in future planning and policy development.	The report is used to inform UK and DA Government policy in relation to health and AQ.
Scotland	**Key finding(s)/content**	**Policy outcome(s)**
Air quality (PM2.5 particulate air pollution) and mortality in Scotland. A briefing paper, **Health Protection Scotland 2014**	• Provides background information on air pollution and health impacts in Scotland. • Provides the current position in relation to policy and strategy on air quality. • Provides information on recent trends in air pollution monitoring in Scotland.	Compliments the PHE study on "Estimating local mortality burdens associated with particulate air pollution" and provides the Scottish perspective.

Legislation and policy relating to emissions to climate change			
Legislation/Policy	**Key requirement(s)**	**Policy outcome(s)**	**Relationship to LES**
Europe			
2030 EU policy framework for climate and energy, due 2014	Key measures proposed include: • Reducing greenhouse gas emissions by 40% (from 1990 baseline). • Increasing the share of renewable energy to at least 27% by 2030. • Increasing energy efficiency by 30% by 2030. • Reform of the EU emissions trading system to make it more	Framework presented by the EU in January 2014 seeks to drive continued progress towards a low-carbon economy. Framework aims to build a competitive and secure energy system that	The LES will contribute to complying with the framework when it is implemented.

	robust and effective. • Competitive, affordable and secure energy. • New governance system.	ensures affordable energy for all consumers, increases the security of the EU's energy supplies, reduces dependence on energy imports and creates new opportunities for growth and jobs.	
Climate action and energy package 2009	• A set of binding legislation which aims to ensure the EU meets its climate and energy targets for 2020. • Sets key objectives for 2020; 20% reduction in EU greenhouse gas emissions from 1990 levels; raising the share of EU energy consumption produced from renewable resources to 20%; 20% improvement in the EU's energy efficiency. • Measures include reforms of emissions trading systems, setting targets for none ETS sources (including transport), national renewable energy targets and carbon capture and storage.	The targets represent an integrated approach to climate and energy policy that aims to combat climate change, increase the EU's energy security and strengthen its competitiveness.	The LES will contribute to complying with the requirements of the package.
United Kingdom			
Climate Change Act 2008	• Sets statutory targets for reducing the net UK carbon account by 80% by 2050 from 1990 emissions of GHGs. • Set legally binding carbon budgets for 5 year periods. • Establish the independent Committee on Climate Change (CCC) to provide advice and guidance to UKG and Das. • Measures to reduce emissions on GHGs (such as emissions trading). • Reporting on climate change. • Assess risks from climate change and develop a programme of adaptation measures. • Waste reduction schemes.		
Scotland			
Climate Change (Scotland) Act 2009	• Creates the statutory framework for GHG emissions reductions in Scotland by setting an interim 42% reduction target for 2020 and an 80 per cent reduction target for 2050. • Requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050. • Establish a Scottish Committee on Climate Change or to designate an existing body to exercise advisory functions. • Scottish Ministers must report regularly to the Scottish Parliament on Scotland's emissions and on the progress being made towards meeting	Provides ambitious legislation to reduce emissions by at least 80 per cent by 2050**,** and will drive new thinking, new solutions and new technologies putting Scotland at the forefront of building a sustainable low carbon economy.	Meeting climate change targets could impact on air quality if both policy areas are not considered together. An effective LES should help deliver climate change targets.

	the emissions reduction targets set in the Act. • Places climate change duties on Scottish public bodies and also contains powers to enable the Scottish Ministers to impose further duties on public bodies. • The Act includes other provisions on climate change including adaptation, forestry, energy efficiency and waste reduction and Public engagement.		

Climate change		
United Kingdom	**Key finding(s)/content**	**Policy outcome(s)**
Reducing the UK's greenhouse gas emissions by 80% by 2050, UK Government 2013	• Setting national policy and strategy to make sure that UK government policies contribute effectively to meeting GHG targets. • Reducing the demand for energy and helping people and businesses to use energy more efficiently. • Investing in low-carbon technologies. • Publicly reporting carbon emissions from businesses and the public sector.	To meet the UK's GHG targets by 2050 with the move to a more energy efficient, low-carbon economy. For the UK become less reliant on imported fossil fuels and less exposed to higher energy prices in the future. A low carbon economy will be a key measure is reducing air pollution and its impacts.
Reducing greenhouse gases and other emissions from transport, UK Government 2012	• Ultra-low emission vehicles (encourage greater uptake). • Reducing emissions from shipping (develop technical, operational and market-based measures at a global level to reduce greenhouse gas emissions from ships). • Biofuels (encourage production and use). • Air quality (ensure that reducing CC emissions also help reduce air pollution).	Reducing greenhouse gases from transport will help the long- term goal of reducing the UK's greenhouse gas emissions by at least 80% compared to 1990 levels by 2050 and also help improve air quality.
Air Pollution: Action in a changing climate, UK Government and the devolved administrations 2010	• Many of our activities, especially transport and energy generation contribute to both local air pollution and global climate change • Consider how the linkages between these policy areas can be managed to best effect. • Choices about the route we take to 2050 will affect the scale of improvements to AQ. • Factoring AQ into decisions about how to reach CC targets results in policy solutions with even greater benefits to society. • Optimising climate change policies for air pollution can yield additional benefits of some £24 billion (net present value) by 2050. • We need to avoid as far as possible policies which tackle CC but damage AQ, and vice versa. • Action at international, EU, national, regional and local levels will be needed to ensure policies are integrated to maximise these co-benefits and ensure ambitious but realistic targets for air pollution are set for the future. • Further action is needed in the much shorter term to meet outstanding EU air quality obligations in the most cost-effective way.	To build links between the policy areas of AQ and CC to ensure opportunities are taken to maximise co-benefits and avoid unintended consequences for either (or other) areas.
Air Quality and Climate: A UK Perspective, AQEG 2007	• Provides scientific background to AQ & CC. • The role of AQ pollutants in climate change.	Identifies synergies between AQ and CC, measures to improve AQ which have co-benefits for CC and trade-offs where the two

	• Impacts of CC on AQ. • Mitigation measures for AQ & CC.	areas conflict.
Scotland		
Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027: The Second Report on Proposals and Policies (RPP2)	• RPP2 is structured around the key sectors of energy supply, homes and communities, business and the public sector, transport, waste and rural land use. • For each of these sectors, policies to reduce greenhouse gas emissions are identified, as are a number of proposals for further consideration and development. • These policies and proposals show that it is possible to meet the climate change targets established by the Climate Change (Scotland) Act 2009. • Builds upon RPP1 (see below).	Meeting climate change targets could impact on air quality if both policy areas are not considered together. An effective LES should help deliver climate change targets.
Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022	• Fulfils the duty placed on Scottish Ministers by the Climate Change (Scotland) Act 2009, to lay before the Scottish Parliament a Report on Proposals and Policies setting out specific measures for reducing GHG emissions to meet Scotland's statutory targets. • Low Carbon Scotland is structured around the key sectors of energy supply, homes and communities, business and the public sector, transport, rural land use and waste. • For each of these sectors, policies to reduce greenhouse gas emissions are identified, as are a number of proposals for further consideration. Taken together, these policies and proposals show that it is possible to meet the annual targets established by the Climate Change (Scotland) Act 2009 each year from 2010 to 2022.	Meeting climate change targets could impact on air quality if both policy areas are not considered together. An effective LES should help deliver climate change targets.

Glossary

ANPR – Automatic Number Plate Recognition
AQ – Air Quality
AQEG – Air Quality Expert Group
AQMA – Air Quality Management Area
AQS – Air Quality Strategy (for England, Scotland, Wales and Northern Ireland)
AURN – Automatic Urban and Rural Network
B[a]P – Benzo [a] Pyrene
BC – Black Carbon
BIF – Bus Investment Fund
BSOG – Bus Services Operators Grant
C_6H_6 - Benzene
CAA – Clean Air Act
CAPE – Clean Air Package for Europe
CAPS – Cycling Action Plan for Scotland
CC – Climate Change
CCC – Committee on Climate Change
CO – Carbon Monoxide
CO_2 – Carbon Dioxide
COMEAP – Committee on Medical Effects of Air Pollution
COSLA – Convention of Scottish Local Authorities
DAs – Devolved Administrations
Defra – Department for Environment, Food and Rural Affairs
DPMTAG - Development Planning and Management Transport Appraisal Guidance

DSRC – Dedicated Short Range Communication
EA – Environment Act
EEA – European Environment Agency
EIA – Environmental Impact Assessment
EC – European Commission
ETS – Emissions Trading System
EU – European Union
EV – Electric Vehicle
GHGs – Greenhouse Gases
HGV – Heavy Duty Vehicle
HRAPIE - Health Risks of Air Pollution in Europe (report)
HPS – Health Protection Scotland
IARC – International Agency for Research on Cancer
ICE – Internal Combustion Engine
IED – Industrial Emissions Directive
IPPC – Integrated Pollution Prevention and Control
ISO – International Standards Organisation
KPIs – Key Performance Indicators
Kt – Kilotonnes
LA – Local Authority
LAQM – Local Air Quality Management
LCV – Low Carbon Vehicle
LDV – Light Duty Vehicle
LGV – Light Goods Vehicle
LES – Low Emissions Strategy
LEZ – Low Emission Zone
NEC – National Entitlement Card
NECD – National Emissions Ceilings Directive
NEDC – New European Driving Cycle
NH_3 – Ammonia
NLEZF – National Low Emission Zone Framework
NMVOCs – Non-methane Volatile Organic Compounds
NO – Nitric Oxide
NO_2 – Nitrogen Dioxide
NO_x – Oxides of Nitrogen
O_3 – Ground-level Ozone
OCR – Optical Character Recognition
PAH – Polycyclic Aromatic Hydrocarbon
Pb - Lead
PHE – Public Health England
PHEV – Plug-in Electric Hybrid Vehicle
$PM_{2.5}$ – Particulate matter with an aerodynamic diameter of <2.5µm
PM_{10} - Particulate matter with an aerodynamic diameter of <10µm
PPC – Pollution Prevention and Control
REVIHAAP - Review of Evidence on Health Aspects of Air Pollution
RPP – Report on Proposals and Policies
RTP – Regional Transport Partnership
RTPI Scotland – Royal Town Planning Institute Scotland
ScotFLAG – Scottish Freight Logistics Advisory Group
SDP – Strategic Development Plan
SEA – Strategic Environmental Assessment
SEPA – Scottish Environment Protection Agency
SO_2 – Sulphur Dioxide
SO_3 - Sulphate
SPP – Scottish Planning Policy
SQP –Statutory Quality Partnerships
STEP – Scottish Transport Emissions Partnership
SUAQG – Scottish Urban Air Quality Group

TRC – Traffic Regulation Condition
TRO – Traffic Regulation Order
TS – Transport Scotland
UK – United Kingdom
UNEP – United Nations Environment Programme
VED – Vehicle Excise Duty
VRM – Vehicle Registration Mark
WHO – World Health Organisation
WLTP – Worldwide Harmonized Light Vehicles Test Procedure

Low Emission Strategy

RESPONDENT INFORMATION FORM

Please Note this form **must** be returned with your response to ensure that we handle your response appropriately

1. Name/Organisation

Organisation Name

Title **Mr** ☐ **Ms** ☐ **Mrs** ☐ **Miss** ☐ **Dr** ☐ ***Please tick as appropriate***

Surname

Forename

2. Postal Address

Postcode	**Phone**	**Email**

3. Permissions - I am responding as…

Individual ☐ / **Group/Organisation** ☐

Please tick as appropriate

(a) Do you agree to your response being made available to the public (in Scottish Government library and/or on the Scottish Government web site)?

Please tick as appropriate ☐ **Yes** ☐ **No**

(b) Where confidentiality is not requested, we will make your responses available to the public on the following basis

Please tick ONE of the following boxes

Yes, make my response, name and address all available ☐

or

Yes, make my response available, but not my name and address ☐

or

Yes, make my response and name available, but not my address ☐

(c) The name and address of your organisation ***will be*** made available to the public (in the Scottish Government library and/or on the Scottish Government web site).

Are you content for your ***response*** to be made available?

Please tick as appropriate ☐ **Yes** ☐ **No**

(d) We will share your response internally with other Scottish Government policy teams who may be addressing the issues you discuss. They may wish to contact you again in the future, but we require your permission to do so. Are you content for Scottish Government to contact you again in relation to this consultation exercise?

Please tick as appropriate ☐ **Yes**

CONSULTATION QUESTIONS

Q1 Do you think the Mission, Vision and Objectives for the Low Emission Strategy are appropriate? If not, what changes would you suggest?

Comments

Q2 Do you think the proposed actions will deliver the Mission, Vision and Objectives? If not, what changes to the actions would you suggest? Are additional actions required? If so, please suggest what these might be.

Comments

Q3 Does the Setting the Scene section accurately summarise the current policy situation? Please suggest changes if not.

Comments

Q4 Does the Way Forward section give a reasonable outline of what further action is needed to deliver an effective Low Emission Strategy? Please suggest changes if not.

Comments

Q5 What are your views on the proposals for the National Modelling Framework?

Comments

Q6 What are your views on the proposals for the National Low Emission Zone Framework?

Comments

Q7 What are your views on the proposed Key Performance Indicators? Are any different or additional Indicators required?

Comments

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