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Cleaner Air For Scotland 2

Towards a Better Place for Everyone

July 2021

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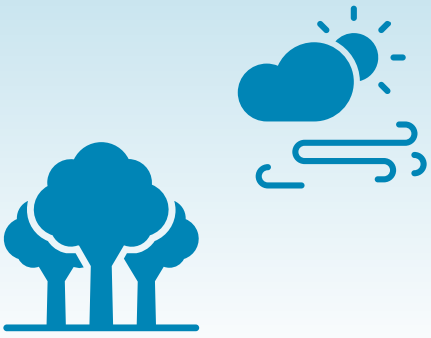
Foreword



Foreword

The air that we breathe is fundamental to the health of our people and planet. Air pollution places quality of life and our precious natural environment at short – and long-term risk. Despite the massive improvements in air quality in recent years, sustained and systemic action continues to be required to ensure we keep making progress.

Scotland is performing well by UK, European and global comparison, with both ambient concentrations and mass emissions of the main air pollutants largely continuing to fall (with the notable exception of ammonia). This is a result of actions taken to date, both nationally and internationally. More remains to be done though, not least as we better understand the impacts of air pollution on both human health and the quality of our environment.

Since our original Cleaner Air for Scotland strategy was published in 2015, we have:

- introduced the most ambitious legislation in the world to end Scotland's contribution to climate change by 2045;
- published our Environment Strategy which emphasises the fundamental role our natural environment plays in supporting a fairer, healthier, more inclusive society;
- updated our National Transport Strategy;
- established Scotland's first Low Emission Zone in Glasgow;
- become the first country in Europe to include the World Health Organization guideline value for PM2.5 in domestic legislation;
- put in place a national PM2.5 monitoring network;
- committed to reducing motor vehicle kilometers by 20% by 2030;
- increased our active travel funding to £500 million over five years from 2020-21; and
- taken major steps to reform Scotland's planning system.

In total, 36 of the 40 actions set out in Cleaner Air for Scotland have been fully completed, with the remainder being carried over into this strategy.

To maximise the benefits from action to tackle poor air quality, it is essential that we build on the linkages with other key government policies and strategies across transport, climate change, health, environment, planning, energy and land use. That's exactly what we're doing.

This new air quality strategy sets out how the Scottish Government will continue to deliver air quality improvements over the next five years. All of this is necessary if we are to secure our vision of Scotland having the best air quality in Europe – a quality of air that aims to protect and enhance health, wellbeing and the environment.

The actions set out in this strategy are built on the work of an independently-led review of Cleaner Air for Scotland completed in 2019. I would like to place on record my thanks to Professor Campbell Gemmell and members of the steering group for the valuable advice and insight they provided through their work. I would also wish to recognise all those that contributed to the review, including members of the four supporting expert groups.

Màiri McAllan MSP,
Minister for Environment, Biodiversity and Land Reform

Overview

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Cleaner Air for Scotland 2 (CAFS 2) is shaped around 10 general themes, which largely reflect the high level recommendations arising from the Cleaner Air for Scotland (CAFS) review.[1]

1. Health – A Precautionary Approach.

The current weight of evidence justifies adopting a precautionary public health approach to air pollution reduction. As a minimum, compliance is required with domestic and international air quality standards but, where practicable and feasible, there should be continued efforts to reduce preventable air pollution still further beyond these limits.

2. Integrated Policy.

Strategies, policies and plans being developed and implemented by central government for placemaking, climate change mitigation and adaptation, and related polices such as noise reduction, should be closely coordinated and aligned with those for air quality in order to maximise co-benefits. Local government, which is largely responsible for implementing the Local Air Quality Management system, besides its planning, transport delivery, public health and regulatory roles, also has a key role to play.

3. Placemaking.

National Planning Framework 4 (NPF4) will transform how Scotland's planning system shapes our places and society over the years and decades to come. The Planning (Scotland) Act 2019[2] requires that the National Planning Framework must have regard to minister's national strategy for the improvement of air quality, so it will provide an important context within which further effort on air quality improvement in CAFS 2 will be delivered, supported by the Place Principle and the Place Standard tool.

1 Cleaner Air for Scotland strategy: independent review – gov.scot (www.gov.scot)
2 Planning (Scotland) Act 2019 (legislation.gov.uk)

4. Data.

There are gaps in both quality and coverage of air quality, transport and human health data in Scotland. Addressing these gaps will help to improve public awareness and engagement, modelling, reporting and ultimately, policy implementation. A greater focus on collecting and presenting traffic data in a way that supports air pollutant emissions understanding will have similar benefits. Health data also require careful consideration so that Scotland-specific interpretations, plans and interventions are strengthened. Wider utilisation of low cost sensor technology, including citizen science initiatives, has a role to play too.

5. Public Engagement and Behaviour Change.

More research is needed to provide clear evidence on levels of knowledge, attitudes, and concern related to air pollution, as well as on willingness to change behaviours which contribute toward air pollution. Many of the key drivers and incentives/disincentives will be closely related to those associated with climate change, but at the same time there will be differences in focus and approach. Development of complementary and co-ordinated public engagement strategies is therefore essential to deliver the required behavioural change outcomes and to avoid confusing or conflicting messages.

6. Industrial Emissions Regulation.

The Scottish Government has made clear its commitment to maintain or exceed EU standards, following the UK's departure from the European Union (EU). The Scottish Government is committed to ensuring that EU environmental principles continue to sit at the heart of environmental policy and law in Scotland. The UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021[3] will bring the guiding European principles on the environment into force in Scots law, including the precautionary principle, polluter pays principle, prevention principle, rectification at source principle and the integration principle. In relation to current regulation, retained EU law will continue to apply, as will domestic regulations made to transpose EU Directives.

7. Tackling Non-Transport Emissions Sources.

Domestic (household) burning and agriculture are two sectors not addressed in detail in CAFS, but which make an important contribution to air pollution. Consideration is needed of performance and standards for domestic fires, stoves and fuels, and local authority powers to permit and control these, and a refreshed approach to good agricultural practice, which includes aiming for increased nitrogen use efficiency in farming. Together, these have the potential to deliver significant improvements in air quality beyond current regulatory and management approaches.

3 https://www.legislation.gov.uk/asp/2021/4/contents

8. Transport.

Increasing modal shift to active travel and public transport is key to further reductions in transport emissions. This will mean, amongst other objectives, providing a transport system that facilitates active travel choices, better public transport provision, embracing new technologies, and constraints upon private vehicle use, especially in urban centres where pollution and congestion are most acute. Establishment of Low Emission Zones in our four biggest cities is also important in this context. The new National Transport Strategy (NTS2), published in February 2020, sets out an ambitious and compelling vision for Scotland's transport system for the next 20 years. The four NTS2 priorities – reducing inequalities, taking climate action, helping deliver inclusive economic growth and improving our health and wellbeing – will underpin our efforts to deliver additional air quality improvements in CAFS 2. The Climate Change Plan update, published in December 2020, will also make a significant contribution to achieving this vision, including the commitment to reduce motor vehicle kilometers by 20% by 2030.

9. Governance, Accountability and Delivery.

Simple and effective governance arrangements and a focus on practical joined up delivery are imperative for CAFS 2. We need to be clear on who is doing what, who is leading, who is supporting and who is ultimately responsible if CAFS 2 is to be delivered as a coherent, integrated and successful strategy.

10. Further Progress Review.

As in the original version of CAFS, the intention is that CAFS 2 will have a five year lifespan. A further review of progress on air quality improvements will commence during 2024 in order to track progress on delivering the actions in the new strategy, besides allowing Scotland to keep abreast of developments in the evidence base, technological advances and societal attitudes, so that new challenges and actions can be identified.

Introduction

Introduction

1. In November 2015, the Scottish Government published 'Cleaner Air for Scotland – The Road to a Healthier Future'.[4] This was the first Scottish air quality strategy separate from the rest of the UK. CAFS sought to bring together the major policy areas relevant to air quality – climate change, transport, planning, health and energy – within one overarching framework. The strategy set out around 40 actions relating to these policy areas. Progress in delivering the CAFS actions is summarised in a series of annual reports, with a final report reviewing the overall achievements of CAFS published in February 2020.[5]

2. When CAFS was published, there was a commitment to review the strategy after five years. However, given the significant number of policy developments with implications for air quality over recent years, alongside an increasing body of evidence demonstrating the human and environmental health impacts of poor air quality, it was decided to bring this process forward. Therefore, in November 2018, the then Cabinet Secretary for Environment, Climate Change and Land Reform commissioned an independently-led review of CAFS. The purpose of the review was twofold, firstly to assess progress to date in implementing the actions contained in the strategy and secondly to identify priorities for additional actions to deliver further air quality improvements.

3. The review was overseen by a steering group chaired by Professor Campbell Gemmell and supported by four specialist working groups covering health and environment; placemaking; agricultural, domestic and industrial emissions; and transport. The steering group submitted its final report[6] to the Scottish Government in July 2019 setting out a series of conclusions and recommendations. Between October and December 2019, an online survey allowed individuals and organisations to submit their views on the recommendations.[7]

4. Both the review findings and those wider views were used to inform development of a draft version of CAFS 2 which was consulted on in late 2020 and early 2021.[8] This final version of CAFS 2 additionally takes into account the responses to that consultation.

The need for additional action on air quality

5. Over the last 50 years, air quality has improved beyond all recognition. The choking smogs of the 1950s are a thing of the past, driven by concerted action, especially on energy use, industry and transport. Air quality in Scotland's towns and cities is improving year on year, but there are still areas across the country where air quality standards for human and environmental health are not being met. Road transport in urban areas remains the significant contributor to poor air quality. Air pollution especially impacts on the more vulnerable members of society – the very young and the elderly or those with existing health conditions such as asthma, respiratory and heart disease. This makes air quality an important health inequalities issue.

4 https://www.gov.scot/publications/cleaner-air-scotland-road-healthier-future/
5 Cleaner air for Scotland: progress report 2018-2019 – gov.scot (www.gov.scot)
6 https://www.gov.scot/publications/cleaner-air-scotland-strategy-independent-review/
7 http://www.scottishairquality.scot/lez/cafs-review-documents
8 Cleaner Air for Scotland 2: consultation – gov.scot (www.gov.scot)

6. As the CAFS review clearly demonstrated, additional work is necessary to ensure full compliance with legislative requirements, and to deliver further human health and environmental quality improvements. Also, the rate of decline in most regulated pollutant sources is now reducing. This suggests that the easier actions or at least those deemed priority, urgent and important have been taken and we are now dealing with the harder issues, where interventions may be more complex and more focused on behaviour change as well as technological improvement. An associated question is what our target levels for the key pollutants should be and how quickly we wish to reach these.

7. The majority of the 40 actions set out in CAFS, together with several additional actions not included at the time of publication have been completed; however some are still ongoing. Those actions will continue to be taken forward in parallel with the new actions set out in this strategy. The CAFS 2018-19 progress report[9] provides full details on completed actions and the status of those still being implemented.

8. Further reductions in air pollution will require concerted action across many sectors including national and local government, the private and public sectors, and by the public itself. Increased awareness and understanding of the key issues and the interlinkages between them is needed, built on the foundation of good place design.

9. At the outset, it is important to state that air pollution, climate change, quality of the urban environment and mobility are strongly interconnected. From this, it follows that effective policy coordination across these broad themes, at both central and local government levels, will deliver co-benefits greater than those possible by considering each in isolation. Although there has been some progress in this regard, it is clear that more needs to be done if these co-benefits are to be fully realised. Key to this will be embedding placemaking principles, with a strong focus on nature-based solutions, across policy areas to guide our way to a cleaner, healthier and more attractive environment. Reducing the need to travel, for example through the development of 20 minute neighbourhoods, along with making it easier for people to utilise sustainable travel options, are also relevant here.

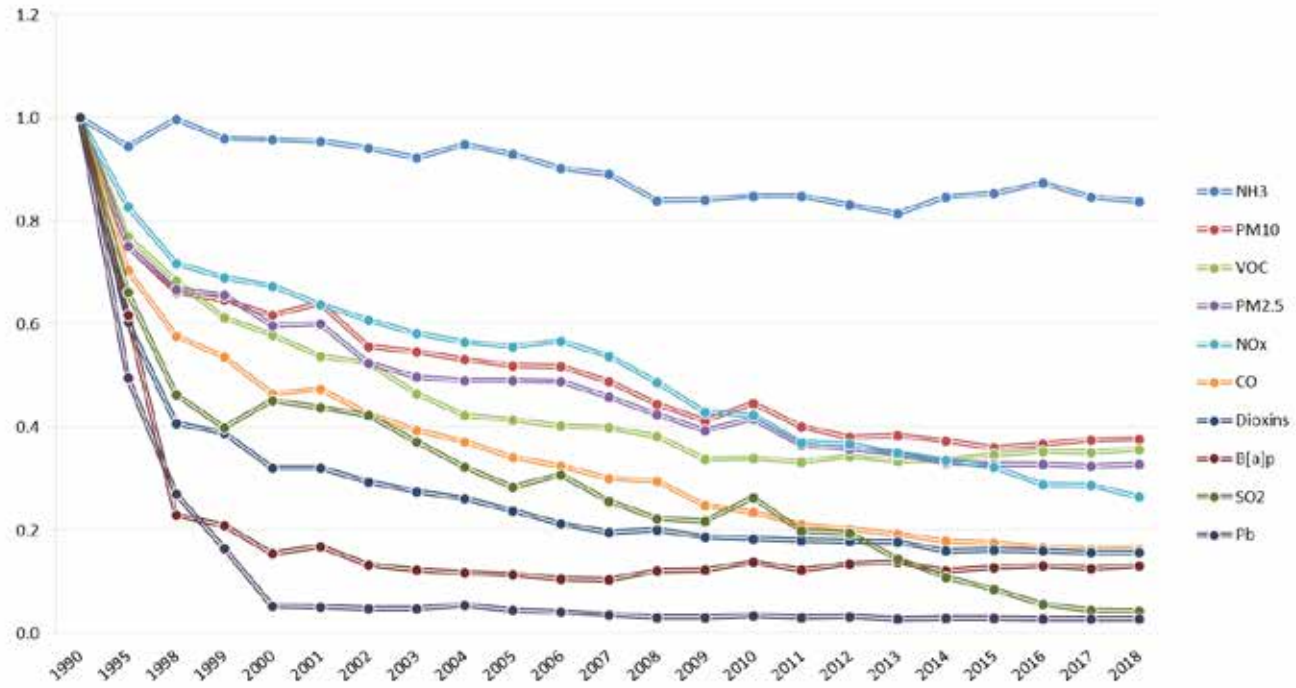
Emissions trends – 1990 to 2018

10. Emissions of the eight main air pollutants are lower in 2018 than they were in 1990 (Figure 1), although the rate of decline for some of these has started to level off in recent years. This rate of decline is relatively similar for particulate matter (PM10 and 2.5), oxides of nitrogen (NOx), non-methane volatile organic compounds (NMVOC), sulphur dioxide (SO_2) and carbon monoxide (CO). Lead (Pb) shows a much higher rate of reduction from 1990 to 2000, coinciding with the phase-out of leaded petrol from 2000. By contrast, ammonia (NH_3) emissions have declined at a slower rate than other pollutants, and even increased slightly over recent years. More detailed information can be found in the 'Air Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2018'[10]

9 https://www.gov.scot/publications/cleaner-air-scotland-road-healthier-future-2018-19-progress-report/pages/6/

10 Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 1990-2018 (defra.gov.uk)

Figure 1: Emissions trends for the main air pollutants in Scotland since 1990 (Source: National Atmospheric Emissions Inventory)



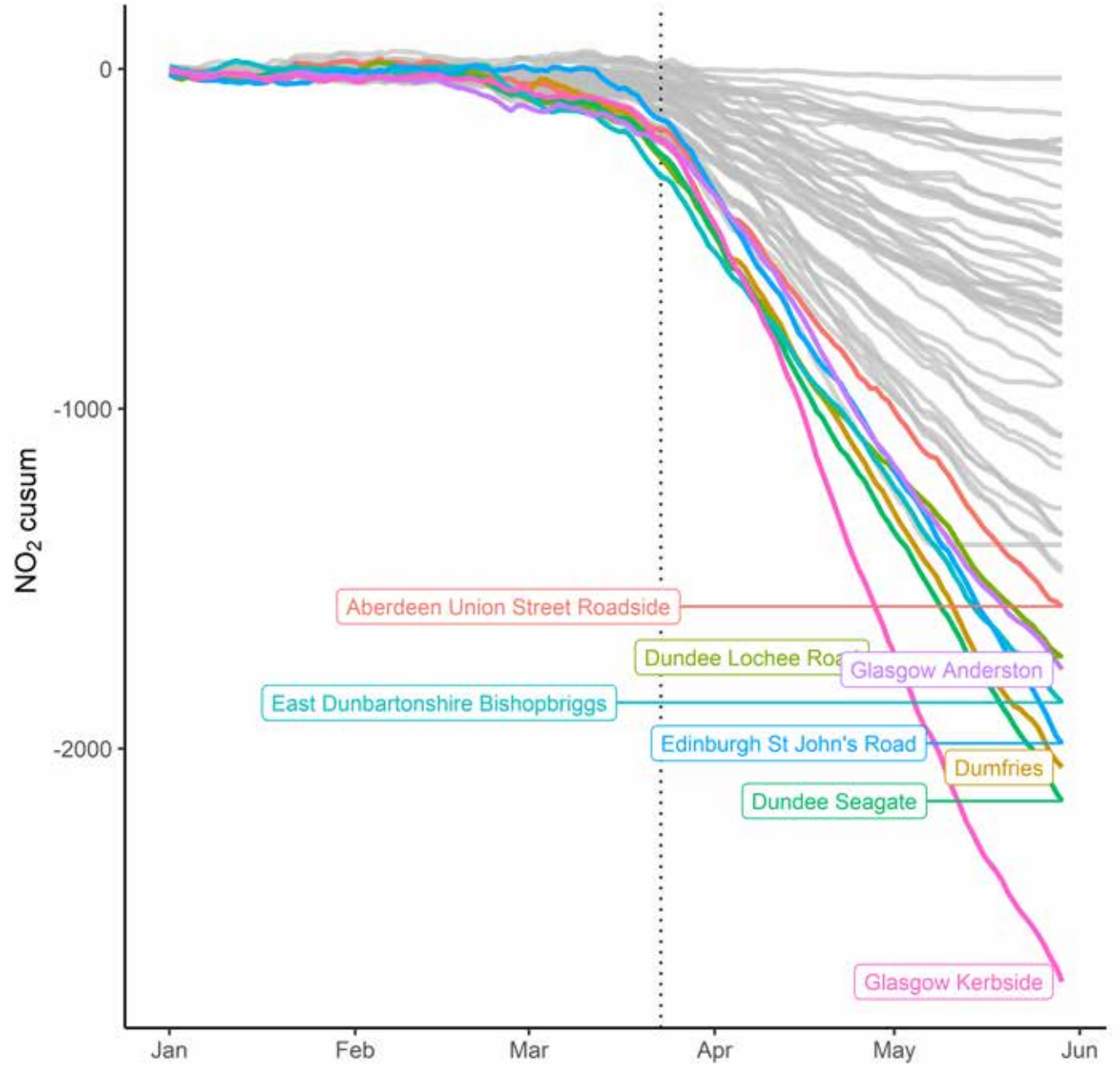
Coronavirus (COVID-19)

11. Since early 2020, the COVID-19 pandemic has changed the way we work, socialise and travel. The current state of knowledge and lessons learnt at the time of publication are reflected in this strategy. Any future developments relating to the pandemic which have implications for the policies set out in CAFS 2 over its five year lifespan will be addressed through updates to the delivery plan which was published alongside the strategy.

12. The unprecedented changes in living and working patterns associated with the COVID-19 lockdown had a significant effect on air pollution.[11, 12] In Scotland, during the initial lockdown period (March to June 2020), nitrogen dioxide (NO_2) levels declined. Analysis of eight urban air quality monitoring stations showed peak decreases from 49% at Atholl Street, Perth to 72% at Hope Street, Glasgow.[13] Pollution levels gradually increased again once lockdown measures began to be relaxed and in many locations gradually returned to pre-lockdown levels. Subsequent reintroduction of certain lockdown measures also impacted on air quality. The significant decrease in pollution levels during lockdown was still not as much as expected, despite large reductions in traffic. This is because much of urban ambient NO_2 is from heavy diesel vehicle emissions, and small numbers of trucks and buses contribute disproportionately to pollution levels. The impact of the lockdown on particulate matter (PM) is more complex. A significant component of PM is transboundary (transported in the atmosphere from elsewhere) and the relationship between traffic reductions and local air quality is therefore not as straightforward as for NO_2. As restrictions are lifted, the key challenges will be to understand how the air pollution reductions seen during lockdown periods can be maintained long-term and sustainably, and how these changes can benefit the long-term health of the population.

11 Microsoft Word – Glasgow LEZ Website_RLDCVMAGRM_IncKeyPoints_Final_061020.docx (lowemissionzones.scot)
12 Public Air Quality Information (sepa.org.uk)
13 http://www.scottishairquality.scot/assets/documents/news/COVID19_lockdown_Time_Variance_analysis_of_air_quality_in_Scotland.html

Figure 2: Changes in NO_2 concentrations at selected monitoring sites between January and June 2020 (Source: Ricardo Energy & Environment)

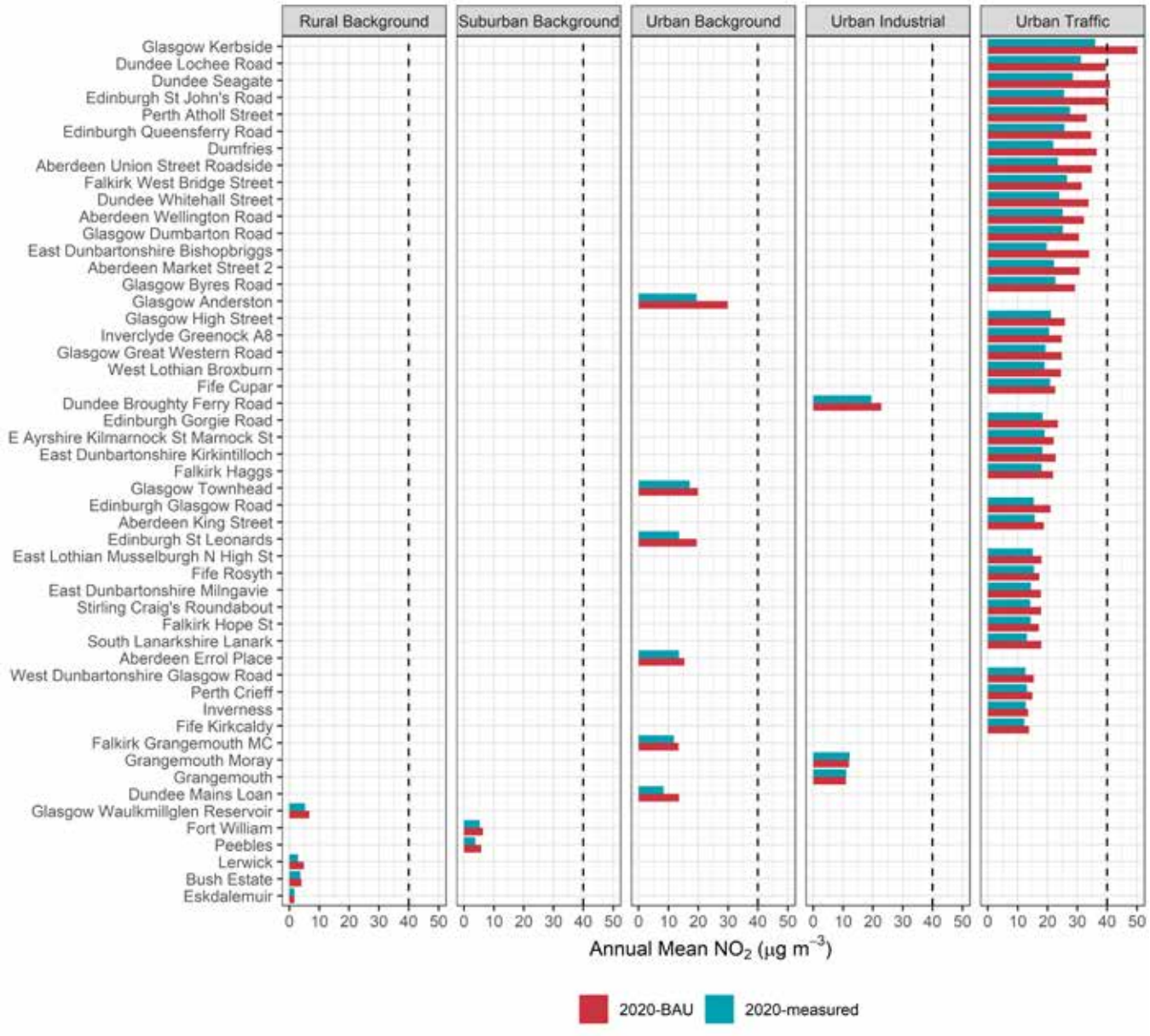


13. Many pieces of research looking at the relationship between air quality and COVID-19 have been undertaken around the world since the start of the pandemic. A number of these studies have identified an association between air pollution and both exacerbated symptoms and mortality levels attributed to COVID-19. However it is necessary to treat the results with caution at this stage. Long-term data covering the full period of the pandemic and beyond will be required in order to draw robust conclusions on the overall impacts of air pollution on total cases and numbers of deaths.

14. At the beginning of July 2020, the Air Quality Expert Group (AQEG), which advises the UK Government and devolved administrations on air quality, published a report of its call for evidence on changes in air pollution emissions, concentrations and exposure across the UK during the pandemic.[14] This provides a useful overview of the available evidence at that point in time. Post-lockdown, rising pollution levels in urban areas could potentially amplify the effects of COVID-19 if the virus is still in circulation at significant levels.

15. It is recognised that green recovery must form a central part of Scotland's emergence from the pandemic. The report of the Scottish Government's Advisory Group on Economic Recovery, published in June 2020, sets out a number of recommendations on how this might be achieved.[15] Such an approach will help Scotland meet its greenhouse gas emissions reduction targets and improve air quality, whilst supporting economic recovery.

Figure 3: Differences between actual and business as usual NO_2 concentrations at Scottish monitoring network sites in 2020 (Source: Ricardo Energy & Environment)



14 https://uk-air.defra.gov.uk/library/reports.php?report_id=1005

15 https://www.gov.scot/publications/towards-robust-resilient-wellbeing-economy-scotland-report-advisory-group-economic-recovery/pages/6/

Air Quality Legislation National Emission Ceilings Directive (NECD)

16. The National Emission Ceilings Directive (NECD) (2016/2284/EU) sets national emission ceilings for certain atmospheric pollutants (nitrogen oxides, non-methane volatile organic compounds, sulphur dioxide, ammonia and (new in the 2016 Directive) fine particulate matter PM2.5). It implements at EU level obligations under the United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution of 1979 (CLRTAP)[16] and, in particular, its 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone of 1999, which was revised in 2012[17] (the revised Gothenburg Protocol). The NECD transposes 2020 targets agreed under the revised Gothenburg Protocol, along with more ambitious targets for 2030. Following the UK's exit from the European Union (EU), the NECD is part of retained EU law.

17. The NECD has been transposed into domestic law through the National Emission Ceilings Regulations (NECR) 2018[18] and the requirements will be implemented at UK level through a National Air Pollution Control Programme (NAPCP).[19] Although the UK has met the 2020 targets for all pollutants (other than ammonia), new policies will be required to ensure 2030 compliance. Further information is set out in the joint UK NACP.[20] The actions set out in this strategy will make an important contribution to the NAPCP and Scotland's wider role in securing compliance with international commitments.

Table 1 – Source Emission Contributions Ranked by Sector, Scotland 2018 (Source: National Atmospheric Emissions Inventory)

Sector	NH3	CO	NOx	VOC	PM10	PM2.5	SO2	Pb	B[a]p	Dioxins
Agriculture	92.0%	IE	0.0%	9.3%	17.5%	4.5%	IE	IE	IE	IE
Energy Industries	IE	4.1%	12.7%	IE	1.6%	2.4%	34.5%	3.6%	0.0%	0.7%
Fugitive	IE	0.7%	IE	13.4%	IE	IE	1.1%	IE	IE	IE
Industrial Combustion	IE	26.5%	14.2%	1.1%	7.7%	13.5%	11.7%	14.9%	0.8%	11.4%
Industrial Processes	0.2%	0.2%	0.0%	53.1%	27.6%	9.2%	4.7%	19.9%	1.5%	6.8%
Residential, Commercial & Public Sector Combustion	IE	43.3%	19.7%	3.2%	25.1%	44.2%	29.1%	9.1%	90.3%	42.9%
Solvent Processes	IE	IE	IE	16.5%	0.6%	0.4%	IE	IE	0.1%	0.5%
Transport Sources	1.2%	23.4%	47.6%	2.7%	15.3%	20.1%	17.7%	51.9%	2.7%	5.1%
Waste	2.0%	0.7%	0.0%	0.0%	1.1%	1.8%	IE	0.6%	4.5%	32.6%
Other	4.5%	1.2%	5.8%	0.6%	3.5%	4.0%	1.3%	0.1%	0.0%	0.0%

* The sector: "other" includes all "other" categories in the inventory and also a number of categories that are insignificant for a specific pollutant. These have been marked in the table as "IE" (used in inventory reporting for "Included Elsewhere").

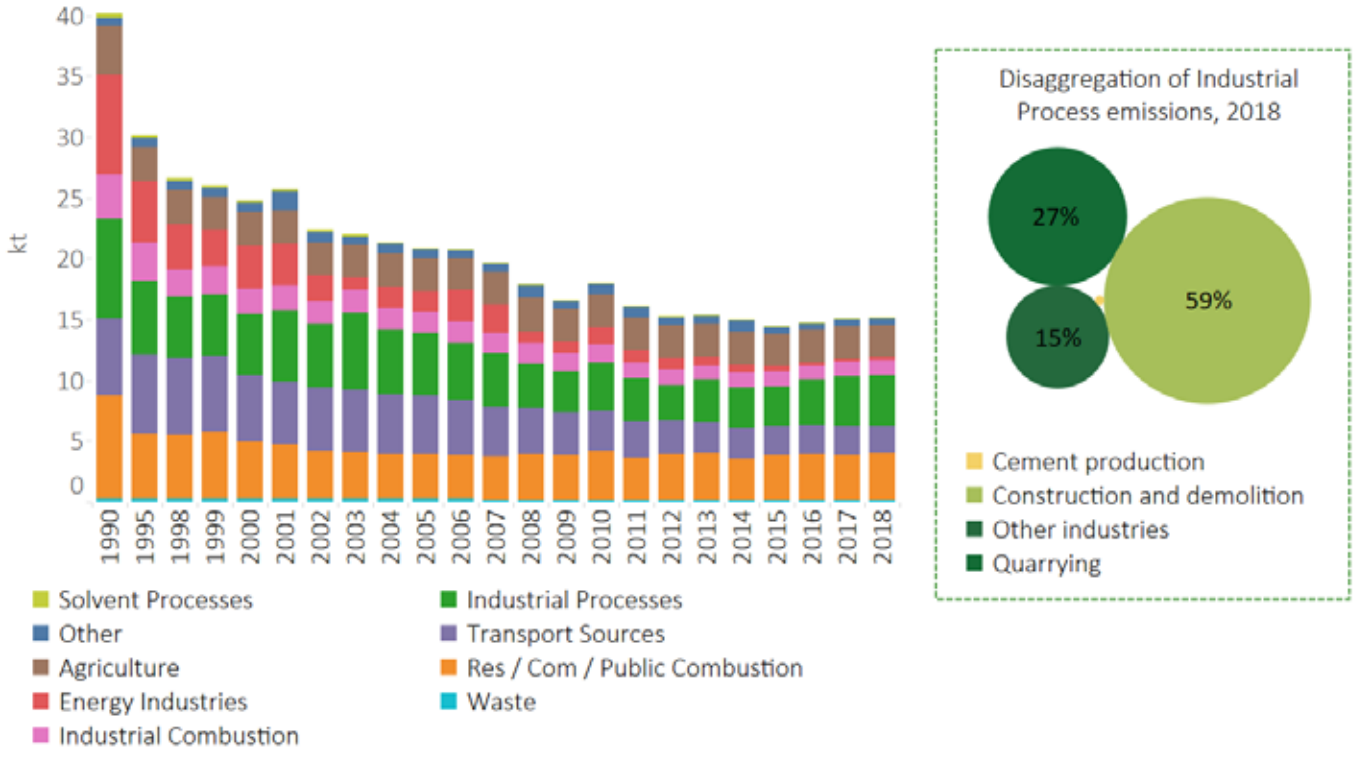
16 https://unece.org/convention-and-its-achievements
17 https://unece.org/environment-policyair/protocol-abate-acidification-eutrophication-and-ground-level-ozone
18 http://www.legislation.gov.uk/uksi/2018/129/contents/made
19 https://www.gov.uk/government/publications/air-quality-uk-national-air-pollution-control-programme
20 https://www.gov.uk/government/publications/air-quality-uk-national-air-pollution-control-programme

Local Air Quality Management

18. Under the Environment Act 1995 and associated regulations, all Scottish local authorities are required to regularly review and assess air quality in their areas against objectives for several air pollutants of concern for human health.[21] If this assessment indicates that any objective is not being met, the authority concerned must declare an Air Quality Management Area (AQMA) and produce an action plan setting out measures to address the issues identified. At the time of publication of this strategy, 36 AQMAs were in place in Scotland, all but two of which were declared for transport-related exceedences of nitrogen dioxide and/or PM10. The majority of issues in these AQMAs relate to localised pollution hotspots within urban centres. The remaining two AQMAs have been declared for industrial emissions of sulphur dioxide and PM10 respectively.[22]

19. Data from the Scottish air quality monitoring network, which consists of around 100 sites across the country,[23] show a clear downward trend in pollutant concentrations in recent years. In some cases, declared AQMAs are already compliant with the objectives; however the Scottish Government requires at least three consecutive years of compliance before revocation can proceed. The Scottish Government is working closely with relevant authorities to ensure revocation can take place as soon as possible. In remaining cases, further progress with action plan implementation is needed to secure compliance.

Figure 4: Changes in PM10 emissions in Scotland since 1990 (Source: National Atmospheric Emissions Inventory)



21 Standards – Air Quality in Scotland (scottishairquality.scot)
22 http://www.scottishairquality.scot/laqm/aqma
23 http://www.scottishairquality.scot/latest/summary

Figure 5: Changes in PM2.5 emissions in Scotland since 1990 (Source: National Atmospheric Emissions Inventory)

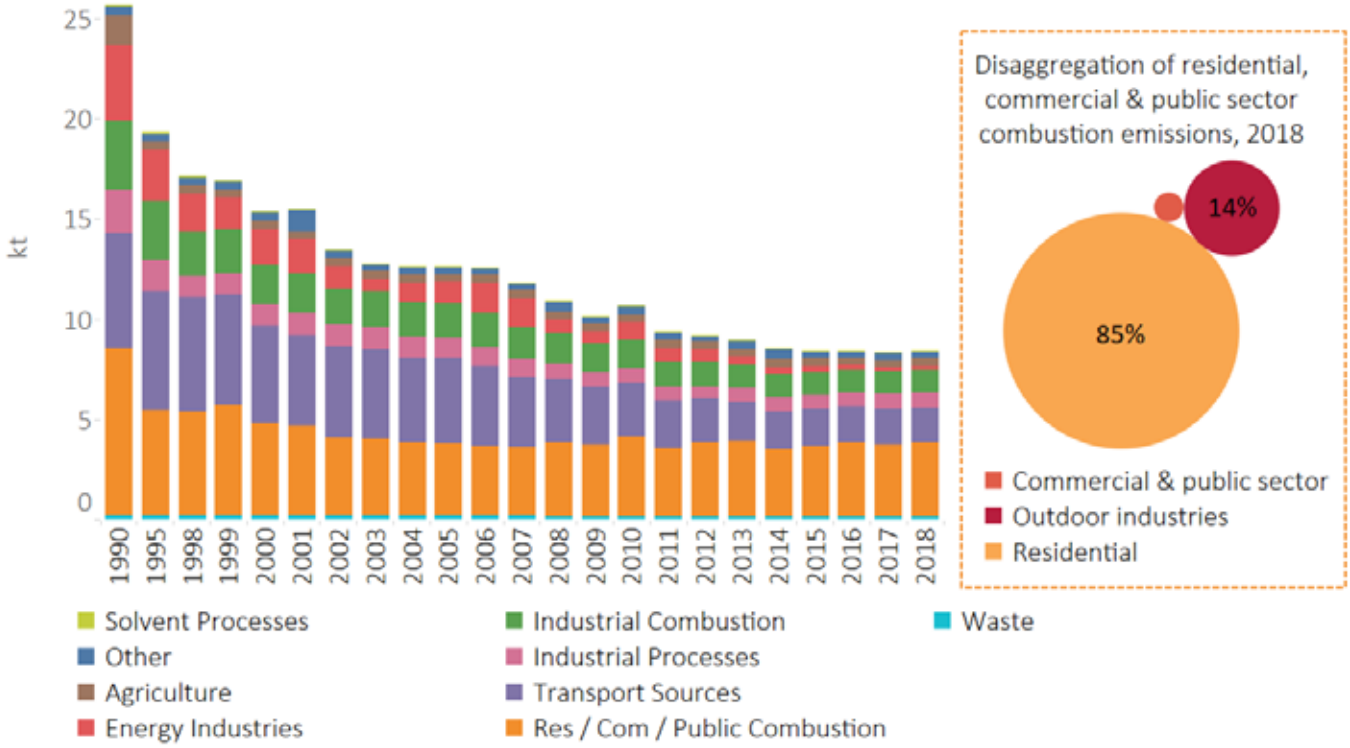
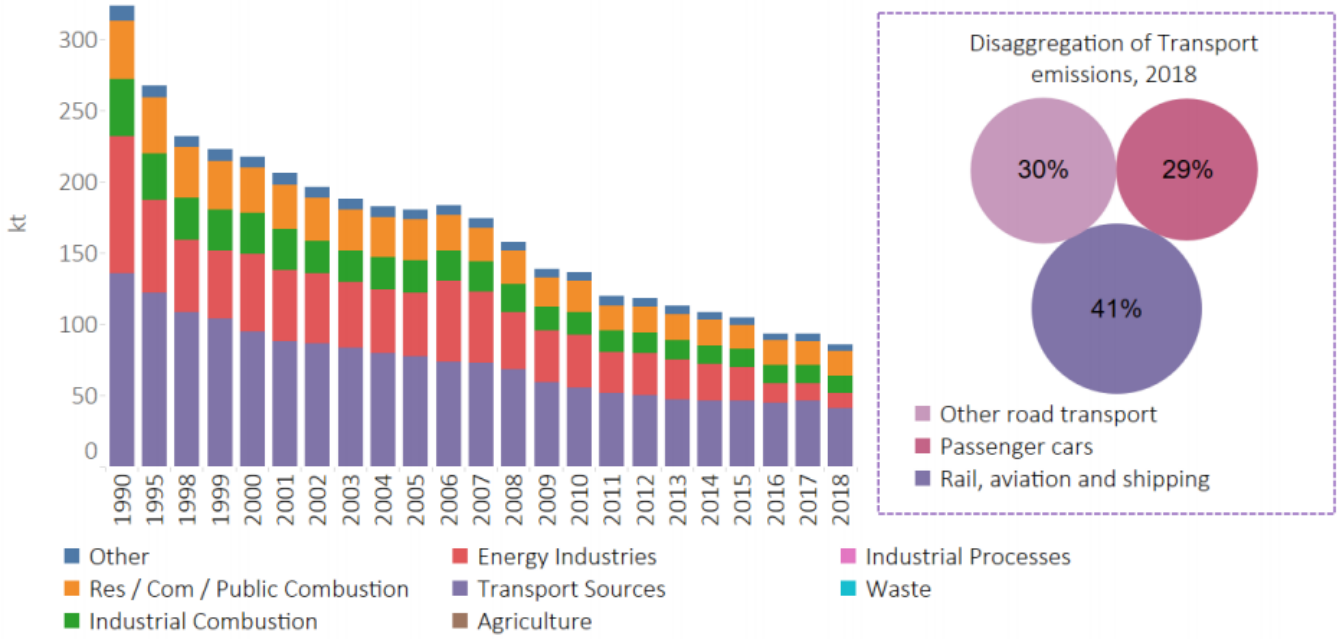


Figure 6: Changes in NOx emissions in Scotland since 1990 (Source: National Atmospheric Emissions Inventory)



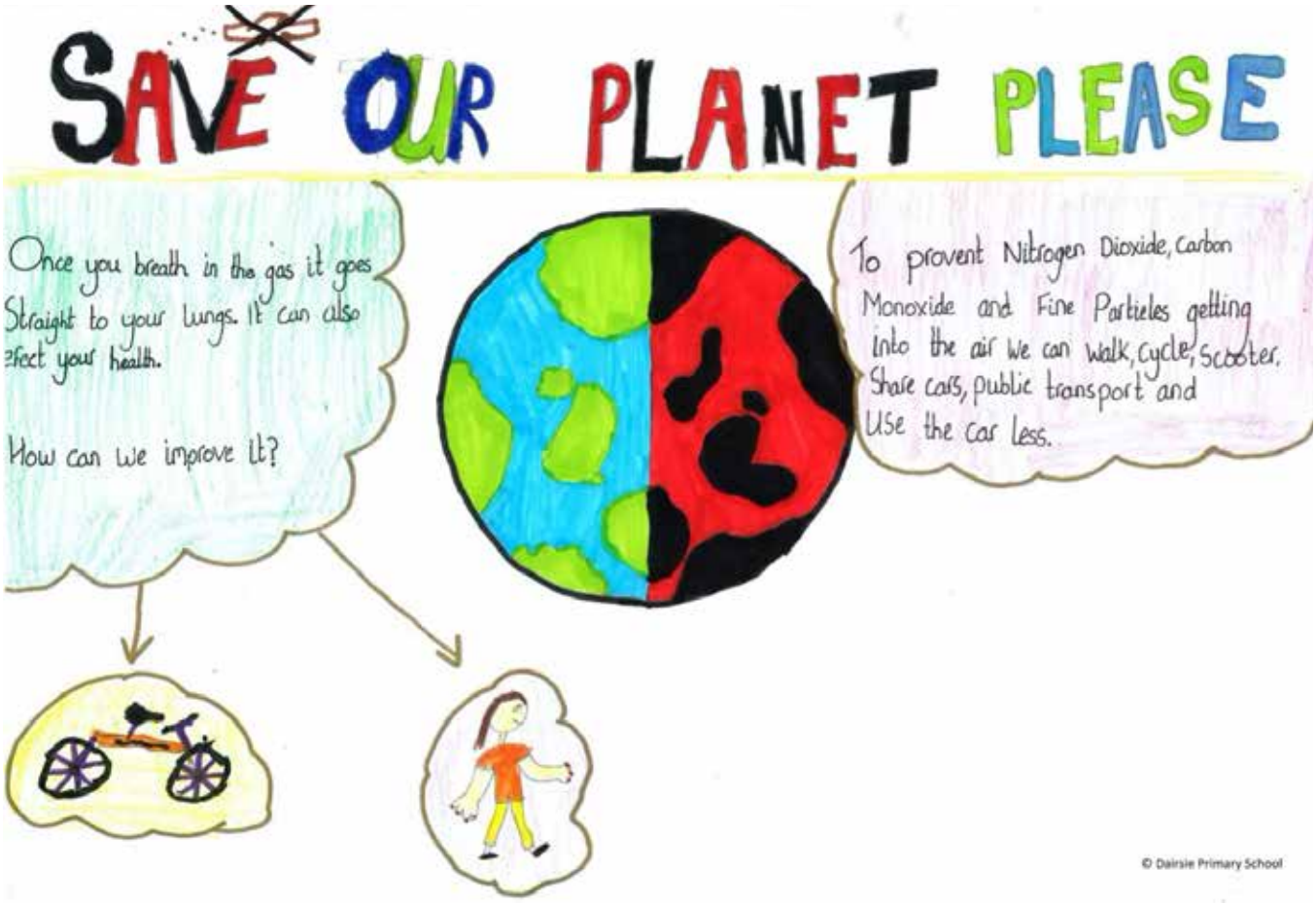
Ambient Air Quality Directive

20. Following the UK's exit from the EU, under retained EU law, the UK is required to meet limit and target values for a range of air pollutants. In Scotland, full compliance has been secured with all of these limit and target values, with the exception of a small number of nitrogen dioxide exceedences.

National Nitrogen Balance Sheet

21. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019,[24] requires the creation of a Scottish Nitrogen Balance Sheet (SNBS) by March 2022. Once established, the SNBS will quantify nitrogen flows at the national scale across economic and environmental sectors, including agriculture, waste management, production and consumption, and between water, land and air. It will also cover all major forms of nitrogen, including air quality pollutants such as nitrogen dioxide and ammonia.

22. The SNBS will provide a baseline on Scotland's current nitrogen use efficiency, i.e. the proportion of nitrogen used for its intended purpose vs. losses to the environment, at a national scale. This baseline creates a new type of cross-sectoral evidence base that quantifies the uses and losses of nitrogen and enables identification of more and less nitrogen use-efficient processes, and will inform future decision-making across a range of policy areas, including air quality. The SNBS itself will also be regularly reviewed and updated.



24 https://www.legislation.gov.uk/asp/2019/15/enacted

1.

Health – A Precautionary Approach

1. Health – A Precautionary Approach

23. There is scientific consensus that exposure to air pollution is harmful to people's health in terms of premature mortality and morbidity, mainly related to respiratory and cardiovascular disease. It is widely accepted that outdoor air pollution causes damage to human health across a wide range of conditions, from pre-birth to old age. Indeed, the evidence of effects of both short-term and long-term exposure continues to grow, with the greatest public health effects being associated with long-term exposure. Air pollution is also harmful to the environment generally, in particular to sensitive habitats and the wildlife depending on these, across Scotland, from local emission sources and more widely through dispersion and long-range transport of air pollutants. A detailed review of the evidence on human health impacts of air pollution was undertaken by the health and environment working group which supported the CAFS review, together with a comparison of the international and Scottish evidence.[25] There is also emerging evidence showing a possible association between air pollution and both exacerbated symptoms and mortality levels attributed to COVID-19, although not all of this evidence will necessarily have taken into account possible confounding factors. This area of research will continue to evolve.

24. Human health improvements are not related solely to direct reductions in air pollution. Policies that improve air quality can potentially have multiple co-benefits for population health, for addressing inequality and for mitigating and adapting to climate change. A prime example is policy to promote active travel. Walking, wheeling and cycling increase physical activity, significantly reduce cardiovascular incidence and mortality, and have been shown to reduce all-cause mortality, even after controlling for other physical activity.[26] Evidence shows that the physical activity benefits of active travel outweigh the harm caused by potentially more exposure to air pollution in all but the most extreme situations. However, walking, wheeling and cycling in places with noticeable poor air quality is a disincentive. Measures to reduce air pollution from road transport and to increase levels of active travel can therefore amplify benefits to public health.

25. Evidence continues to accumulate on the impacts of poor air quality, expanding our understanding of how air pollution is harmful to public health and the environment. Although many of the most important pollutants are now below accepted existing health based limits, areas of concern remain. Despite the general downward trend, high levels of nitrogen dioxide persist in some urban hotspots. Scotland is fully compliant with fine particulate matter targets at EU level, and almost so domestically, but there is currently no known threshold below which health impacts don't occur.[27] This means that we must continue to take action on improving air quality across the country, including areas where targets are being met. In addition ammonia, which is a major contributor to particulate matter formation and also has direct environmental impacts, around 90% of which is generated by the agricultural sector, has not reduced at anything like the same rate as other pollutants, and even increased over some recent years.

26. More evidence is also available on effective interventions for reducing people's exposure, especially to transport-related pollution. Consequently, despite recent encouraging trends, there remains scope for further beneficial reductions.

25 http://www.scottishairquality.scot/assets/documents/Health-Environment-Working-Group-Report.pdf
26 http://www.scottishairquality.scot/assets/documents/Health-Environment-Working-Group-Report.pdf
27 http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf?ua=1

27. Other issues that correlate closely with air pollution in terms of impacts on people and the environment also need to be taken into account, including noise (especially transport-generated noise) and greenhouse gas emissions that contribute to global climate change. Increased awareness of these interrelationships is needed, as is the potential to link co-beneficial mitigating actions. Given the close linkage between outdoor and indoor air pollution and the high proportion of time spent indoors, especially by urban dwellers, indoor air quality is also important.

28. Taking this evidence into account, in 2016 Scotland became the first country in Europe to adopt into domestic legislation the World Health Organization (WHO) guideline value for $PM_{2.5}$ of 10µg m^3 as an annual mean,[28] meaning that local authorities are required to take action to reduce $PM_{2.5}$ levels in areas where this objective is being exceeded. At the time of publication, the WHO was in the process of reviewing this guideline value.

29. The relationship between air pollution and mortality is complex, with multiple interacting factors, one of which may be air quality, typically contributing to the death of a specific individual.[29] Using the recommended approach of the WHO and based on previous work undertaken by the UK's Committee on the Medical Effects of Air Pollution (COMEAP), in 2018 Health Protection Scotland (HPS) provided an estimate of approximately 1,700 attributable (premature) deaths in Scotland annually.[30] It is important to note that attributable deaths are not actual recorded deaths in a particular year; the figure is a statistically derived estimate, intended to convey as faithfully as possible the amount of excess mortality caused by air pollution across the population as a whole. The figure should therefore not be interpreted as the number of individuals in any year where air pollution has made some contribution to earlier death; that number is unknown but is almost certainly larger. Although no figure has been calculated for the combined impact of $PM_{2.5}$ and NO_2 on attributable deaths, based on the $PM_{2.5}$ estimate and taking into consideration internationally derived risk estimates, around 2,000 attributable deaths annually may be a reasonable number.[31]

30. There is some uncertainty from international studies about the scale of health effects associated with low pollutant concentrations typical of those found in much of Scotland today. The body of Scottish research, while relatively small, has repeatedly demonstrated impacts of pollutants on respiratory illness that are consistent with international evidence. There is also growing evidence from around the world showing associations of air pollution with other important health conditions including cardiovascular disease, dementia, diabetes, and adverse pregnancy outcomes (low birth weight and prematurity). Collectively this constitutes good evidence that air pollution, even at the concentrations found in much of Scotland, is linked to excess ill health. Consequently, despite the recent encouraging trends in air pollution in Scotland to date, there remains scope for further beneficial reduction. However, given the relatively low ambient pollutant levels across most of the country, it is difficult to predict, and is likely to be hard to demonstrate accurately, the level of additional health gain that might result from further reductions in air pollution.

31. Achieving these aims will require concerted action to make health-focused policy development more of a joint priority across all relevant central and local government departments. To achieve meaningful change, everyone – government, business and industry, employers (private and public) and the general public – will need to be encouraged to play their part in helping to reduce the future health burden associated with avoidable air pollution.

28 http://www.legislation.gov.uk/ssi/2016/162/contents/made
29 Inquest into the Death of Ella Adoo-Kissi-Debrah (blackstonechambers.com)
30 https://www.hps.scot.nhs.uk/web-resources-container/air-pollution-and-health-briefing-note-mortality-associated-with-exposure-to-fine-particulate-matter-pm25-attributable-mortality-in-scotland/
31 http://www.scottishairquality.scot/assets/documents/Health-Environment-Working-Group-Report.pdf

32. The inequalities issues associated with the effects and impacts of air pollution on health require further consideration. The Scottish Index of Multiple Deprivation (SIMD)[32] contains extensive and valuable data which can be used to explore evidence of links between socially deprived communities and air quality. The relationship between deprivation and air quality is complex, and it is not always the case that the most deprived areas will experience the worst air quality.[33] At the same time, those who generate the least air pollution are often those who suffer its effects most. Low access to economic opportunity often combines with poor health, low activity levels and reduced access to affordable mobility, all of which have the potential to exacerbate the impacts of air pollution.

33. The key, therefore, when implementing measures to tackle air pollution must be to avoid inadvertently embedding environmental injustice into proposed solutions. For example when introducing Low Emission Zones and other controlled access schemes, careful planning is needed to ensure that the vehicles affected are not simply displaced into surrounding areas.

34. Air pollution causes harm to human health and, while significant improvements have been made, the impacts continue to be felt. Whilst there is increasing evidence of both population-level and specific impacts that require to be addressed, causation is often hard to prove given the multiple and interlinked factors affecting health. More action is required, both in order to achieve legal compliance with domestic and international standards and to further improve the overall health of the population of Scotland, in particular those most vulnerable members of society upon whom air pollution can have the most acute impacts. We must work coherently and effectively together, across central and local government, to develop and implement integrated health-focused policies which deliver lower air pollution and better health outcomes.

Indoor air quality

35. Urban populations in the UK spend around 90% of their time indoors; the quality of the indoor air is therefore at least as important as that of outdoor air. Indoor air quality is influenced by multiple factors including ambient outdoor air pollution. This makes estimating the health impacts of indoor air quality alone very challenging. Unlike outdoor air quality, there are no regulated limits for indoor pollutants in domestic settings in the UK. The WHO published guidelines in 2010 on safe concentrations of indoor air pollutants for general use, and the Health and Safety Executive (HSE) publishes occupational limits for a range of workplace air pollutants.[34] Guidance on domestic indoor air quality has been produced by the National Institute for Health and Care Excellence (NICE)[35] and, in January 2020, the Royal College of Paediatrics and Child Health (RCPCH) published a review on the impacts of indoor air quality on children and young people.[36]

36. Given the wide range of factors contributing to indoor air quality, no single body or organisation can realistically have sole responsibility for addressing it. Thus there is a need for policy integration and coherence to avoid the risks of unintended consequences. Non-health-related developments (for example relating to building standards, furnishings or cleaning products) could have unexpected adverse health impacts if a wider perspective is not taken.

32 Scottish Index of Multiple Deprivation 2020 – gov.scot (www.gov.scot)
33 http://eprints.gla.ac.uk/159742/7/159742.pdf
34 https://www.hse.gov.uk/pubns/books/eh40.htm
35 https://www.nice.org.uk/guidance/ng149
36 https://www.rcpch.ac.uk/resources/inside-story-health-effects-indoor-air-quality-children-young-people

In-vehicle emissions

37. In-vehicle air quality[37] studies tend to compare outside and inside air pollution levels with evidence suggesting that air quality inside vehicles can be significantly poorer when compared to typical roadside pollution levels experienced by pedestrians and cyclists. Very few studies compare different transport modes on the same routes at the same time. The measurement of in-vehicle air pollution – and the associated development of risk reduction strategies – is still an emerging science. There is also limited research into in-vehicle air quality caused by the use of the recirculation mode on vehicle air filter systems and its impacts on driver health, wellbeing and alertness.

38. In-vehicle air quality personal exposure can be influenced by a complex array of factors beyond the transport mode choice, such as traffic conditions, traffic intensity and road type. Mitigation actions to reduce in-cabin air pollution may include keeping a safe distance from vehicles ahead, keeping windows closed when in traffic (which may presumably be undertaken by the majority of drivers) and setting the vehicle ventilation for a short period of time to recirculation mode. There is also emerging evidence on the role of in-vehicle CO_2 associated with using the recirculation mode in a car with multiple passengers on a non-local journey.

Actions

We will:

- Assess the evidence on health impacts of low level pollution in countries with levels of ambient air pollution comparable to Scotland.
- Commission population research on the long-term effects of air pollution using cohort methods to aid further understanding of health impacts and explain the apparently different epidemiology in Scotland.
- Convene a task group to identify what, if any, actions might best be undertaken at Scottish level to address the issues associated with indoor air pollution.
- Commission an assessment of actual exposures experienced by a representative sample of the Scottish population, assessing pollution exposures over a realistic activity range during a normal time period.
- Contribute to research on in-vehicle air quality measurement methodology, the use of recirculation mode for long-distance journeys related to CO_2 and in-vehicle air pollution related to occupational health.

37 Can refer to a mix of pollutants including ultrafine particles (particulate matter (PM10, PM2.5 and PM0.3), black carbon (BC), ultrafine particle number concentration (UFP), aromatic hydrocarbons, carbonyls, semi-volatile organic compounds, total volatile organic compounds (TVOCs), carbon monoxide (CO), carbon dioxide (CO_2), airborne bacteria, microbes and fungi levels.

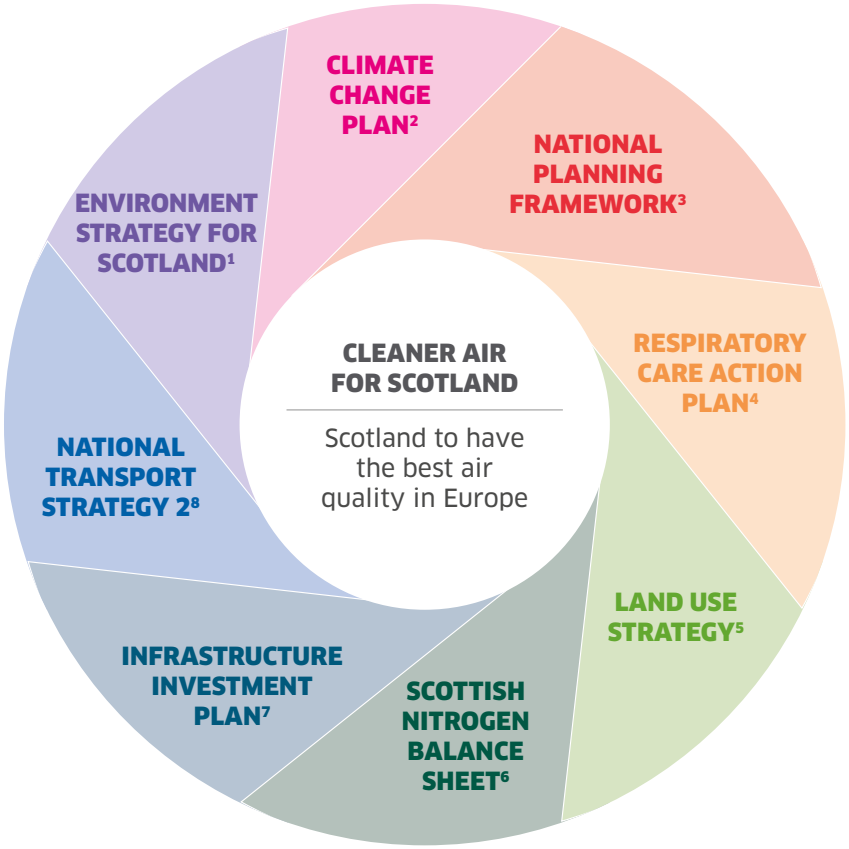
2.

Integrated Policy

2. Integrated Policy

39. The public health effects of indoor air quality and noise pollution correlate strongly with those of outdoor air pollution. Similarly, there is significant overlap between the measures needed to address climate change and improve air quality in areas such as transport, agriculture and industrial emissions. Effort to address these issues in a more coordinated way offers additional likely co-benefits. Improving air quality makes an important contribution to the United Nations Sustainable Development Goals[38] and the Scottish Government's National Outcomes.[39] In a wider context, further progress in embedding placemaking principles across all policy areas will deliver benefits for both physical and mental health through creating better urban spaces that are more attractive to spend time and easier to move around in. Associated positive impacts on land and water quality, biodiversity and ecosystem health will also arise from such an approach.

40. CAFS 2 must work in tandem with other key Scottish Government strategies in order to achieve the vision for Scotland to have the best air quality in Europe. Clear synergies exist between these strategies, which include (but are not limited to):



1 https://www.gov.scot/publications/environment-strategy-scotland-vision-outcomes/

2 Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update – gov.scot (www.gov.scot)

3 National Planning Framework | Transforming Planning

4 www.gov.scot/publications/respiratory-care-action-plan-scotland-2021-2026

5 https://www.gov.scot/publications/scotlands-third-land-use-strategy-2021-2026-getting-best-land/

6 https://www.gov.scot/policies/climate-change/nitrogen-balance-sheet/

7 Government finance: Infrastructure investment – gov.scot (www.gov.scot)

8 https://www.transport.gov.scot/publication/national-transport-strategy-2/

38 https://sustainabledevelopment.un.org/?menu=1300
39 https://nationalperformance.gov.scot/index.php/national-outcomes

41. The Environment Strategy for Scotland creates an overarching framework for Scotland's strategies and plans on the environment and climate change. Its 2045 vision and supporting outcomes set our ambition for restoring Scotland's natural environment and playing our full role in tackling the global climate and nature crises. In turn, this will support a stronger, more resilient economy, improve the health and wellbeing of Scotland's people and help to ensure we live within the planet's sustainable limits.

42. CAFS 2 will support delivery of this strategic approach, including many of the Strategy's outcomes. Specifically, those including protecting and restoring Scotland's natural environment and creating a fairer, healthier and more inclusive society.

Linking in with this strategic approach are Scotland's guiding principles on the environment. The guiding principles, set out in section 13(1) of the UK Withdrawal from the European Union (Continuity) Scotland) Act 2021 ("the Continuity Act") are:

- the principle that protecting the environment should be integrated into the making of policies;
- the precautionary principle;
- the principle that preventative action should be taken;
- the principle that environmental damage should be rectified at source; and
- the principle that polluter should pay.

43. The Continuity Act places a duty on both ministers and public authorities to have due regard to the guiding principles when developing policies and legislation, supporting our objectives to maintain and improve environmental standards and contribute to Scotland's response to the twin climate and nature crises. These principles have informed the development of CAFS 2 and will inform our actions as the strategy is implemented.

44. It is crucial that our transport and placemaking agendas interact in a way that drives real and measurable emissions reduction, whilst enabling great places where people live, work and play to become even more connected, accessible, affordable and efficient. Regional Transport Partnerships (RTPs) and Regional/Local Transport Strategies have an important role to play here too.

Air pollution and climate change

45. Greenhouse gases and air pollutants share common sources, notably transport, energy generation and land use practices, and will thus benefit from many of the same policy interventions. Some air pollutants can also act as greenhouse gases (e.g. ozone) or contribute to their formation (e.g. nitrogen oxides). Conversely, changes in the climate will impact on air quality; increases in temperature may affect ozone formation, increasing the frequency and severity of summer photochemical smogs, and increase emission rates of ammonia. At the same time, air pollution and climate change generally act at different scales, both spatially and temporally. Greenhouse gases are most active high up in the atmosphere, whereas the most important factors for air quality are the location and level of concentration of pollutants nearer the earth's surface, with increased impacts near emission hotspots. There are also complex relationships and trade-offs between the various pollutants that need to be managed. For example black carbon makes a significant warming contribution, besides being an important component of particulate matter (PM). Reducing such emissions therefore has a clear benefit for both climate change and air quality. On the other hand, whilst reducing sulphur dioxide emissions has been positive for both public health and the environment, atmospheric cooling from sulphate or 'white' aerosols (secondary PM) it helps to form is also reduced.

46. With transport being Scotland's largest greenhouse gas (GHG) emitting sector,[40] the National Transport Strategy (NTS) climate action and health/wellbeing priorities highlight the crucial role of transport in delivering improvements to both climate and air quality emissions. Actions on climate change and air quality can present policy interlinkages and offer tangible co-benefits[41] in a way that supports delivery of our air quality vision.[42]

47. Employers across all sectors are adapting Carbon Management Plans (CMPs) to formulate GHG strategies that support the net-zero agenda[43] and circular economy. In doing so, many CMPs are broadening their reach beyond traditional aspects such as estate energy management and travel planning, but we should not lose sight of these core tenets, particularly given the thinking and lessons learnt around homeworking and estate management prompted by the COVID-19 pandemic.

48. In 2016, the CAFS Governance Group commissioned a report 'Synergies and tensions between climate change and air quality actions'.[44] The report, including 50 key recommendations, was intended to help inform the 2018 Scottish Climate Change Plan. The report also contributed to the work of a UK cross-department group that has been set up to explore the requirements and opportunities for cross disciplinary research to provide a stronger evidence base for analysing the synergies and tensions of policy and regulation of air quality and climate change. Of the 50 recommendations made in the report, 38 presented strong evidence of synergies between tackling climate change and improving air quality simultaneously.

40 Scottish greenhouse gas emissions 2017, https://www.gov.scot/publications/scottish-greenhouse-gas-emissions-2017/pages/3/

41 https://ccacoalition.org/en/resources/synergizing-action-environment-and-climate-good-practice-china-and-around-globe

42 For example, societal change toward the reduction in demand for unsustainable travel could see modal shift through the uptake of active travel or public transport (with less reliance on single occupancy private car use) to help reduce climate and air quality related emissions. Promoting active travel will also improve health and wellbeing.

43 https://www.zerowastescotland.org.uk/save-energy-reduce-waste/carbon-management-plans

44 http://www.scottishairquality.scot/assets/documents/CAFS-Climate-Change-Sub-Group-Report.pdf

49. By 2018, Scotland's greenhouse gas emissions had declined by 50% since a 1990/1995 baseline. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[45] sets a target of net zero emissions of all greenhouse gases by 2045. The Act also sets interim targets of a 75% emissions reduction by 2030, and 90% by 2040. The Scottish Government has updated its 2018 Climate Change Plan[46] to account for the new targets in the 2019 Act. The Climate Change Plan update (CCPu) sets out plans for a green recovery from COVID-19, alongside a strategy to meet future emissions reduction targets over the period to 2032.

50. Building on the initial policies set out in the Scottish Government's Programme for Scotland 2019-20,[47] the CCPu contains a wide range of measures that will provide air quality benefits, aligning closely with the aims of this strategy. Measures include our ambitious commitment to reduce car kilometers by 20% by 2030, our commitment to phase out the sale of new petrol and diesel cars and vans by 2030, our investments in active travel and our policies aimed at reducing emissions from the freight sector. We have committed to annual progress reporting against the CCPu, and in May 2021 we published our first report since the CCPu included a refreshed monitoring framework. The report will include our assessment of whether progress towards our indicators is on track. Relevant indicators include the percentage reduction in car kilometers, and several indicators on the increase in number of ultra low emission vehicles (ULEVs).

51. A key part of the Scottish Government's approach on climate change is ensuring a just transition. This means reducing emissions in a way which is fair for all and leaves no-one behind. The Climate Change (Emission Reduction Targets) (Scotland) Act 2019 contains a set of just transition principles, that ministers must have regard to when setting out plans to reduce emissions.

52. To further support the application of just transition principles, in 2019 the Scottish Government established the Just Transition Commission to advise ministers on how we can maximise the economic and social opportunities of meeting our climate change targets, while managing the challenges.[48] The Commission published its final report in March 2021, containing a range of recommendations to help deliver a just transition in Scotland.[49] We have committed to publishing a full, considered, cross-government response to the report by late summer this year. We will also maintain the Commission to advise us throughout the course of the next Parliament.

53. The Scottish Government's approach on just transition is in line with the desired outcome of better air quality. Embedding just transition principles in government policy will therefore help deliver a win-win in the form of reduced greenhouse gas emissions and improved air quality for people all over Scotland, in turn ensuring the benefits of climate action are shared widely.

54. The Scottish Government's approach to adapting to the impacts of climate change here in Scotland which cannot be avoided is set out in the second statutory Scottish Climate Change Adaptation Programme (which covers the period to 2024).[50] The Programme follows an outcome-based framework aligned to Scotland's National Performance Framework and UN SDGs, within which the impacts of air quality on health is recognised. Delivery of the current strategy will support progress to Scotland's climate change adaptation and resilience outcomes.

45 http://www.legislation.gov.uk/asp/2019/15/contents
46 Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update – gov.scot (www.gov.scot)
47 https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/pages/5/
48 https://www.gov.scot/groups/just-transition-commission/
49 Just Transition Commission: A National Mission for a fairer, greener Scotland – gov.scot (www.gov.scot)
50 https://www.gov.scot/publications/climate-ready-scotland-second-scottish-climate-change-adaptation-programme-2019-2024/

Air pollution and noise

55. As yet there are no fixed noise level targets in Scotland or the rest of the UK. In 2002, the EU adopted the Environmental Noise Directive[51] which stipulates that measurements must be taken of ambient noise, with the results being made publicly available and action plans for noise reduction must be agreed. The World Health Organization (WHO) published guidance in 2018 on environmental noise levels taking account of existing health effects evidence.[52]

56. In Scotland's four biggest cities, it has been estimated that over 1 million people are exposed to noise levels in excess of the WHO guidelines during the daytime and over 0.8 million during the night, with evidence indicating that deprived communities suffer more.[53] The health impact costs have not been directly estimated in Scotland but, based on WHO estimates elsewhere, are likely to be considerable.

57. As with urban air pollution, the major source of ambient noise is road traffic. The adverse impacts of air pollution are closely correlated with those of noise, making it difficult to separately assess the impact of traffic noise on health. However, this does mean that many interventions aimed at reducing traffic-sourced air pollution are also likely to help reduce excess traffic-sourced noise. These interventions range from traffic reduction in urban areas to physical solutions such as green barriers along roads.

Actions

We will:

- Work with local authorities to ensure that noise action plans are closely aligned with air quality action plans to deliver co-benefits. Guidance will be produced to facilitate this.
- Ensure that all actions taken by the Scottish Government to address air quality maximise the potential for co-benefits with climate change mitigation and adaptation. The 50 recommendations for maximising co-benefits set out in the CAFS Governance Group climate change report will be used to guide this process. We will work with local authorities to ensure that a similar approach is taken at local level.
- Ensure that actions in the Scottish Government's Climate Change Plan maximise co-benefits for air quality.
- Ensure that the Scottish Nitrogen Balance Sheet to be established by March 2022, reflects the contributions to air pollution from all sectors of the economy. Also, ensure that the new evidence base from the Balance Sheet is used to inform future policy making around air quality and its alignment with other strategic frameworks. Once established, the Balance Sheet will be reviewed on a regular basis.

51 Noise – Environment – European Commission (europa.eu)

52 http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018

53 https://noise.environment.gov.scot/noise-statistics.html

3.

Placemaking

3. Placemaking

58. Placemaking means working collaboratively across professions and communities to identify the best place-based solutions for the issues that we face. Overall, to improve and maintain air quality, development approaches to place should have an emphasis on mixed use neighbourhoods with:

- the population density to sustain local services, planned and in locations that reduces the need to travel unsustainably;
- makes best use of existing transport infrastructure; and
- builds in walking and wheeling as the most natural choice to get around.

59. Reducing the need to travel will be significant in dealing with air quality in urban areas, but is not the only action needed to improve air quality. 20 minute neighbourhoods,[54] giving people the ability to meet most of their daily needs within a 20 minute walk from home, with safe walking, cycling, and public transport options will allow people to 'live local' and reduce car dependency. Application of these principles will vary across the country given geographical, community and economic influences but can be beneficial in a range of settings.

60. If we get placemaking right, we can tackle air pollution, create better, more sustainable places, contribute to improved physical and mental health and provide high quality spaces for work, life and play. This in turn makes locations more attractive for business, too. The report produced by the CAFS review placemaking working group[55] provides further background and context.

The Place Principle

61. In April 2019, the Scottish Government and CoSLA agreed to adopt the Place Principle[56] to help overcome organisational and sectoral boundaries, encourage better collaboration and community involvement, and improve the impact of combined energy, resources and investment in Scotland's regions, cities, towns, and neighbourhoods. It promotes a shared understanding of place, to support inclusive and sustainable outcome improvement and the need to take a more collaborative approach to a place's services and assets to achieve better outcomes for people and communities. The Place Principle brings ideas about investments, resources and assets under one roof and is based on an understanding that decision making and delivery that is informed by the people who live and work locally is key to the economic, social, cultural and environmental success of places. The principle encourages and enables local flexibility to respond to issues and circumstances in different places.

54 20 minute places (partnersinplanning.scot)
55 http://www.scottishairquality.scot/assets/documents/Placemaking-Working-Group-Report.pdf
56 https://www.gov.scot/publications/place-principle-introduction/

Nature-Based Solutions

62. Nature-based solutions aim to help societies address a variety of environmental, social and economic challenges in sustainable ways. They are actions which are inspired by, supported by or copied from nature. Some involve using and enhancing existing natural solutions to challenges, while others are exploring more novel solutions, for example mimicking how non-human organisms and communities cope with environmental extremes. Nature-based solutions use the features and complex system processes of nature, such as its ability to store carbon and regulate water flow, in order to achieve desired outcomes, such as reduced hazard risk, improved human wellbeing and socially inclusive green growth. Maintaining and enhancing natural capital, therefore, is of crucial importance, as it forms the basis for implementing solutions. These nature-based solutions ideally are energy and resource-efficient, and resilient to change, but to be successful they must be adapted to local conditions.

63. The European Commission (EC) has highlighted the role that nature-based solutions can play in placemaking.[57] There is growing recognition and awareness that nature can help provide viable solutions that use and deploy the properties of natural ecosystems and the services that they provide in a smart, 'engineered' way. These nature-based solutions provide sustainable, cost-effective, multi-purpose and flexible alternatives for various objectives. Working with nature, rather than against it, can further pave the way towards a more resource efficient, competitive and greener economy. It can also help to create new jobs and economic growth, through the manufacture and delivery of new products and services which enhance the natural capital rather than deplete it.

64. Glasgow City Council's approach to developing scaled-up nature-based solutions is underpinned by its Open Space Strategy (OSS). Based on a wealth of data and spatial analysis, the OSS sets out an approach to coordinate the various open space responsibilities to ensure well-managed, well located and well-connected open spaces that operate as part of a wider green network.

65. Glasgow's OSS is a good example of how using nature-based solutions to enhance and increase open space, can deliver multiple benefits for society, the economy and the environment. In this way, open spaces can offer opportunities for creating places for strong community cohesion, ecosystem services, healthy life, and access to jobs, education and culture, while responding to climate change including heavy rainfalls, heat waves and floods. There are also significant opportunities for air quality improvement driven by key outcomes of the OSS, such as ensuring more journeys are made by active travel and better access to green and blue space.

57 https://ec.europa.eu/research/environment/index.cfm?pg=nbs

Planning Policy and National Planning Framework 4

66. The Scottish Government is reviewing its national planning policies, National Planning Framework 3 (NPF3)[58] and Scottish Planning Policy (SPP)[59] with a view to bringing them together into a single policy document National Planning Framework 4 (NPF4). The Planning (Scotland) Act 2019[60] requires that the revised National Planning Framework has regard to any national strategy in respect of the improvement of air quality prepared by Scottish ministers. The Planning Act also makes it a requirement for planning authorities to prepare and publish an open space strategy covering their policies and proposals as to the development, maintenance and use of green infrastructure in their district, including open spaces and green networks.

67. Currently, planning policy includes air quality broadly as a principle that contributes to sustainable development as well as a matter of particular concern for certain types of development including mineral workings and for town centres. The policy strongly supports active travel, green infrastructure and a design-led approach as a basis of placemaking to create high quality places.

68. The NPF4 Position Statement[61] set out our thinking in November 2020 on what the likely policy changes might be in the draft NPF4, reflecting on early engagement undertaken. It established that NPF4 would likely focus on achieving four key outcomes: Net Zero Emissions; Resilient Communities; A Wellbeing Economy; and Better Greener Places. The Position Statement is clear that NPF4 will help to deliver this new air quality strategy, including through new policies to improve air quality alongside reducing climate change emissions. It recognised the contribution of natural infrastructure to clean air and the need to continue to safeguard air quality in meeting demand for primary materials. It highlighted the potential for further development of the six qualities of successful places to reflect broader priorities including clean air. It also indicates that future policies will ensure that the National Transport Strategy 2 Sustainable Travel and Investment Hierarchies are embedded into development plans and proposals.

69. More broadly, the Position Statement identifies key opportunities around climate change that are also relevant to air quality, including:

- 20 minute neighbourhoods;
- supporting development locations that help us transition away from car dependency;
- supporting low carbon living in rural areas as well as towns and cities through digital infrastructure and remote working;
- low and zero carbon design and energy efficiency;
- low carbon heating and renewable energy; and
- expanding green infrastructure.

NPF4 will have development plan status, meaning its policies should be capable of day to day use by planning authorities in determining planning applications.

58 https://www.gov.scot/publications/national-planning-framework-3/
59 https://www.gov.scot/publications/scottish-planning-policy/
60 http://www.legislation.gov.uk/asp/2019/13/introduction/enacted
61 Fourth National Planning Framework: position statement – gov.scot (www.gov.scot)

70. We anticipate a draft NPF4 to be laid before the Scottish Parliament in autumn 2021, which will be accompanied by public consultation. The draft will provide Ministers' spatial planning policy response to CAFS 2. The final NPF4 is anticipated to be approved by the Scottish Parliament and published in 2022.

Impact Assessments

71. Air quality impacts may be considered where required in Environmental Impact Assessment (EIA) of development proposals and in Strategic Environmental Assessment (SEA) of plans, programmes and strategies. In the UK, there are currently several risk assessment tools and mechanisms for making decisions on the risks from air pollution. However, the information required can be held in different places, thus making the process very labour intensive and lacking integration.

72. The UK Inter-agency Air Pollution Group (IAPG) coordinated by the Joint Nature Conservation Committee (JNCC), has been working on alignment and streamlining the risk assessment process of air pollution effects on ecosystems. The wider Integrating Tools for Air Pollution Assessment (ITAPA) project was implemented to assess the options to streamline ecological risk assessment of air pollution in the UK. The ITAPA Project concluded that an integrated tool would provide the best cost-benefit method for risk assessment of air pollution effects in the UK. At the same time, CAFS set out the commitment for a National Modelling Framework (NMF). This identified the need for regional air quality assessment tools as part of the planning and development process.

73. As a consequence of the initial ITAPA recommendations, the UK AERIUS pilot tool partnership project has been initiated between Defra, the devolved administrations (DAs) the country nature conservation bodies (CNCBs) and JNCC and is funded by Defra and DAERA (Department of Agriculture Environment and Rural Affairs). The UK AERIUS pilot project was set up to develop an online tool to support UK risk assessment of air pollution effects on ecosystems, statutory reporting requirements and, ideally, issue of permissions for individual plans or projects (e.g. Environmental Permits, planning permissions, etc.). UK AERIUS is based on the Dutch AERIUS integrated risk assessment system for decision making on individual plans or projects seeking permission from competent authorities.

74. Building on the success of the Local NMF, SEPA commissioned a Scottish regional air quality modelling project that will aim to feed into UK AERIUS, with the focus on developing an air quality assessment tool for impacts based on human health standards. Similar to the Local NMF that was used to provide the evidence for Low Emission Zones (LEZs), the regional model will rely on good quality traffic data. The first phase of the SEPA project is to develop the base road network and collect relevant traffic information at a regional scale; this work is underway. The project will identify any gaps in the database and provide recommendations for future traffic collection programmes.

The Place Standard

75. The Place Standard tool[62] was produced by the Scottish Government, Public Health Scotland,[63] Architecture and Design Scotland and Glasgow City Council and launched in December 2015. The Place Standard tool supports individuals, communities and public, private and third sector organisations to think about both the physical elements and the social aspects of a place together in a structured way by asking a series of questions based on the evidence about which aspects of place are important to health and wellbeing, This provides a framework for evaluation, for assessing the strengths and weaknesses and for prioritising areas for action to improve new and existing places. The Place Standard tool is designed to support a place-based approach and the delivery of high quality, sustainable places that promote community wellbeing and more positive environmental impacts, maximising the potential of the physical and social environment to support health, wellbeing and a high quality of life and reduce health inequalities.

76. A revised version of the Place Standard tool will be launched in 2021 to address gaps in the original tool identified, including enhancements to better enable place-based conversations to address climate change and improve environmental sustainability. The integrated approach offered by the Place Standard tool to understanding the physical, social and economic aspects of a place provides a holistic means of assessing and taking action on issues such as travel and transport, green infrastructure, place design and layout, that can deliver co-benefits such as air quality improvements. A 'Design' version aimed at designers (architects, planners), developers and clients is also being created to support the design process to deliver healthier places, including the delivery of air quality improvement co-benefits.

77. Furthermore, for those who wish to look at air quality in more detail, additional prompts with an air quality focus will be available to enhance the Place Standard assessment. This will provide guidance to support a stronger focus on air quality within a holistic assessment of a place, which can support specific action to address air quality concerns.

62 https://www.placestandard.scot/

63 This organisation was NHS Health Scotland until end of March 2020.

Actions

We will:

- Ensure that NPF4 has regard to CAFS 2 in its preparation, in accordance with the Planning (Scotland) Act 2019.
- Continue to promote the use and role of the Place Standard tool(s) in place-based approaches, enabling delivery of air quality improvements as a co-benefit of delivering high quality, sustainable places that support health and wellbeing and reduce health inequalities.
- Work with local authorities who wish to develop a targeted approach where appropriate for utilising the Place Standard tool with an air quality focus.
- Undertake a review of nature-based, green and blue infrastructure interventions which can benefit air quality, using the outcomes to develop a database of potential solutions for both regeneration and new developments.
- Work with local authorities to assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross-departmental working, identifying and addressing evidence, skills, awareness and operational gaps.
- Promote the aims of the UK ITAPA project in developing an online air pollution risk assessment tool for air pollution effects on ecosystems.
- Implement the NMF regional air quality model to assess the effects of land-use development on local air quality.

4.

Data

4. Data

78. There is a comprehensive body of air quality data for Scotland going back many years, which provides an invaluable resource for assessment and policy development.[64] At the same time, it is important that we regularly review our approaches to data collection and utilisation, to ensure that we realise the potential of new technologies, continue to collect data that are relevant, robust and fit for purpose, and link effectively to related datasets that can provide added value in supporting joined up policy delivery.

79. Until relatively recently, the vast majority of real-time measurements of air quality in Scotland and the rest of the UK were made by established reference methods, using monitoring equipment that meets defined international standards for data quality. However, in the last decade there has been rapid growth in the development of low cost sensors for air pollution measurement. These can range from simple single pollutant sensors to relatively sophisticated multi pollutant devices that include communications and meteorological capabilities, differing from reference methods in features such as accuracy, compactness, mobility, lifespan and lower power consumption.

80. Low cost sensors have a number of potential advantages. In particular they allow for a much larger number of measurements to be made, covering a wider geographical area. Some are small enough to be carried on or by individuals, allowing direct estimates of personal exposure to be made. They can also be used to complement or improve upon existing modelling-based approaches to supplement monitoring data. Additionally they can play a useful role in education and awareness raising. At the same time, there are many uncertainties. Sensor technology is evolving rapidly, and accuracy is often an issue, making it difficult to judge the merits of and make recommendations on the use of specific instruments. Therefore data from low cost sensors cannot be used to report directly against compliance with legal air quality objectives. Their use beyond citizen science and awareness raising are to assess spatial and temporal trends to identify air pollution issues that cannot be adequately captured by reference methods. The Air Quality Expert Group (AQEG), which provides independent scientific advice to central government in the UK, has produced a detailed overview of low cost sensor technology and application.[65]

81. Low cost sensors also have a valuable educational role, both in schools and wider citizen science projects. SEPA has been working with schools in several local authorities on the CleanAir@School project, enabling pupils to measure air pollution at their school, with trends being used to build evidence for behaviour change actions. The project had 10 Environmental Protection Agencies (EPAs) across Europe participating, with the final report on the project published in February 2021.[66] Learn About Air[67] is a dedicated teaching resource, linked to Scotland's Curriculum for Excellence, for pupils to learn about air quality, the impact it has on their lives and how they can influence it. It also provides a powerful mechanism to feed this message back into the pupil's home environment, thus reaching the wider population.

64 http://www.scottishairquality.scot/
65 https://uk-air.defra.gov.uk/library/aqeg/pollution-sensors.php
66 Assessing air quality through citizen science – European Environment Agency (europa.eu)
67 http://www.learnaboutair.com/SEPA/

Remote sensing

82. At the other end of the data collection scale are remote sensing technologies. Satellite observations can provide extensive spatial and temporal coverage, not just for air pollutant concentrations – with current technology being capable of measuring all the main air pollutants – but for related climatic, meteorological and land use parameters. Whilst the resolution is typically coarser than ground instruments (although this is improving as the technology becomes more advanced) satellite measurements provide full spatial coverage, capable of addressing gaps in areas with little data from other sources. Remote sensing can also be used to support validation of emissions estimates by low cost sensors, besides enabling enhanced forecasting of regional and transboundary air pollution events.

83. The potential for remote sensing to support and enhance standard approaches to air quality monitoring and modelling in a similar way to low cost sensors has not to date been explored in detail in Scotland but will be considered further as part of the implementation of this strategy, taking account of work in this area being progressed by other organisations such as SEPA and the Environment Agency.

Traffic data

84. Good quality data are essential for making key decisions. Historically though, traffic data has rarely been collected for direct application to air quality management and improvement, even though many geographic and time-specific data gathering exercises have been undertaken by central and local government for particular purposes. There is currently no systematic long-term approach to gathering traffic data at a large scale for environmental purposes, and improvements are thus needed in both robustness and utility. This has begun to change in recent years with the introduction of the National Modelling Framework for Scotland (NMF), which provides the basis for a national approach to both local and regional air quality modelling. However the development of detailed local models for Aberdeen, Dundee, Edinburgh and Glasgow to provide the evidence base for Low Emission Zone (LEZ) introduction in these cities[68] was only made possible by undertaking detailed targeted traffic data collections. This contrasts with the well-established approaches for collecting air quality and other environmental data.

85. Traffic interventions to reduce emissions should be based on the best possible transport data that reflects vehicle/people movements and mode choice. The NTS2 calls for an improvement in the quality and availability of information to enable organisations and individuals to (1) plan their journeys in the most cost effective or time efficient way (particularly where an interchange is needed) and (2) inform transport fleet management decisions. We must make it as easy as possible for people to make informed travel choices and encourage more sustainable travel. This will require information to be available that is as close to real time as possible, relevant, reliable and easy to both access and use.

68 https://www.lowemissionzones.scot/

86. Information may relate to air pollution monitoring data derived from a mix of sourcing including reference and low cost sensor networks, real-world vehicle data and various intelligent transport system (ITS) solutions including traffic counts and Automatic Number Plate Recognition cameras. Consideration should also be given to emerging or future third party datasets such as satnav data or mobile phone locational services, which currently help to support congestion detection and support journey planning, along with future connected vehicle datasets.[69]

87. Data sharing between transport agencies and the likes of SEPA, local authorities, the NHS, Public Health Scotland and Police Scotland should also be promoted. Ideally, the information should be stored and managed in a way that allows multiple data sources to be captured and accessed easily whilst complying with General Data Protection Regulation (GDPR) requirements.

88. The Scottish Government implemented a real-world vehicle emission monitoring programme in 2019 using remote sensing technology. Over 300,000 data points were collected on the trunk road network around Edinburgh during October 2019 and February 2020. Emissions monitoring on local and trunk roads improves our understanding of real-world fleet emissions including insight into the performance of emission abatement retrofit technology on fleet vehicles (which the Scottish Government is also funding) and the potential to detect emission defeat-device technology.

69 Cooperative Intelligent Transport Systems (C-ITS) refers to transport systems where there is a wireless data exchange between two or more ITS sub-systems (personal, vehicle, roadside and central) which will support a number of information, warning and assistance services which will be gradually deployed during the oncoming years.

Actions

We will:

- Commission a review of air quality data collection and reporting in Scotland. The review will identify any notable gaps in data provision, with recommendations on how to fill these. The review will also provide recommendations on how current air quality data and methodologies can be more effectively integrated with other datasets, particularly those relating to transport, human health, environmental quality and spatial planning.
- Commission research to explore the potential of utilising satellite data to complement air quality monitoring.
- Develop an approach for standardised annual collection and storage of traffic data which can be used for multiple purposes, including air quality management.
- Undertake a review of road transport data capture and associated gaps with relevance to air quality.
- Collect transport data within Air Quality Management Areas and beyond to support air pollution mitigation planning, following the good practice established by SEPA's National Modelling Framework (NMF).[70]
- Explore options for transport, air quality and health data sharing between public bodies.
- Provide guidance to local authorities on how best to always commission traffic data collection in a way that supports local air quality objectives.
- Develop a central data storage for traffic data to support the development and use of SEPA's regional NMF (and UK AERIUS)
- Establish a comprehensive network of air quality emissions monitors on local and trunk roads in the early 2020s.

70 Detailed and tailored traffic and air quality data collection exercises between 2017 and 2020 in Scotland's four major cities have underpinned the development of the NMF. The NMF provides a two-tiered standardised approach to modelling air quality at both local and regional levels using a nationally consistent methodology. The city models inform LEZ design decision making, whilst the regional model offers an air quality assessment-based tool within and across neighbouring local authority areas associated with large-scale planned developments.

5.

Public Engagement and Behaviour Change

5. Public Engagement and Behaviour Change

89. Public information provision, awareness and behavioural change are interlinked and integral to the delivery of long-term sustained change in environmental quality generally and air pollution specifically.

90. Our proposals on public engagement and behaviour change are informed by a review of evidence around public attitudes and behaviour relating to air quality, undertaken by the University of the West of England. The review report was published in August 2020.[71]

91. The review showed that there is limited evidence available on public perceptions specifically of air quality in Scotland. The review therefore also encompassed emission-generating activities (e.g. transport/travel, domestic energy) and related issues (low carbon, climate change, energy production). Based on the wide range of studies identified in this broader context, there appears to be a strong awareness of, and engagement with, air quality and climate change issues, at least in certain sectors of society in Scotland. There are however, significant barriers to engagement and, importantly, behaviour change, particularly amongst deprived communities.

92. As with public perception, limited research on public engagement around air quality issues has been undertaken in Scotland. Accordingly, the range of evidence covered in the review was widened, both in terms of the issues covered and geographically. This resulted in the identification of a range of public engagement approaches, from communication tools, traditional questionnaires and focus groups, to more participatory citizen panels, citizen science, living labs and co-creation, and novel techniques using social media and gamification.

93. The review highlighted that air quality behaviours are informed by many complex factors that need to be considered when designing meaningful and effective future engagement. Effective public engagement should draw upon an assortment of different approaches, using materials from other successful strategies to build a coordinated suite of multi-media initiatives. Support from communications experts and commitment from a range of actors, e.g. national and local government, public health agencies, public transport providers, businesses and schools is also required. Planned long-term monitoring and evaluation should be designed into the campaign to identify the effectiveness of strategies, and to allow organisers to learn from the successes and follow up on areas of weakness. Coupling evaluation with evidence on how public engagement has contributed can create a feedback exchange, and also enable citizens to reflect on their experiences in a more informed way. Furthermore, the engagement strategy, materials and evaluation reports should be transparent and publicly available to allow others to benefit.

71 www.gov.scot/isbn/9781839607745

94. Based on the review of current evidence, the following recommendations are made as a basis for future public engagement on air quality issues in general terms and specifically for developing a public engagement strategy on air quality in Scotland:

- Consider a holistic approach that reflects citizens' lived experiences rather than focusing exclusively on air quality.
- Use a range of pre-piloted engagement approaches, informed by communications and subject experts.
- Ensure engagement approaches are inclusive of all sectors of society and appropriately communicated.
- Target specific groups separately, e.g. vulnerable groups, user groups.
- Gain support from and include a range of actors, e.g. national and local government, public health agencies, public transport providers, businesses, agricultural industry and schools.
- Research the affected communities and actively engage with them to understand the socio-cultural contexts and complexities of their needs.
- Co-create solutions that work for the affected communities, through citizens' panels, and 'living labs', ensuring participants are demographically representative.
- Support citizen-led engagement events and activities, e.g. citizen science.
- Ensure promoted behavioural changes are easier, more convenient and preferably cheaper than the status quo.
- Incorporate information on ammonia and the impacts of atmospheric nitrogen pollution on biodiversity more generally into public information about air quality.
- Raise awareness responsibly, ensuring that risk perceptions and data interpretation are managed and achievable behavioural responses are provided.
- Focus communication on health and environmental impacts, rather than concentrations or emissions.
- Use change agents, influencers and middle actors to help raise awareness and promote behaviour change to affect normative behaviours.
- Use social media to spread awareness through wider social connections and families.
- Initiate further research and programmes of action to raise awareness of and engagement in the issue of atmospheric nitrogen pollution.
- Plan longitudinal monitoring and evaluation, coupled with citizen feedback, into the public engagement design.
- Ensure materials and evaluation are made available to benefit other public engagement strategies.

A useful starting point could be a baseline survey to identify, in a Scotland-specific context, current awareness of health effects of air pollution and source contributors.

95. The review also identified several evidence gaps which need to be addressed. Key issues include real or perceived barriers to uptake of low/zero emission vehicles and further modal shift to public transport and active travel, alongside associated behavioural drivers. Similar issues around switching to low/zero emission energy sources also require consideration.

Actions

We will:

- Develop a public engagement strategy on air quality in Scotland, taking into account the recommendations from the evidence review.
- Undertake a baseline survey of current awareness amongst the Scottish public of air pollution health effects and source contributors.
- Actively link with other agencies and organisations that are not air quality specific, but which deliver programmes having co-benefits for air quality improvements and behavioural change, such as Cycling Scotland, Sustrans and Living Streets.
- Continue to support Clean Air Day and other activities promoting raising awareness of air pollution.

6.

Industrial Emissions Regulation

6. Industrial Emissions Regulation

96. Emissions from industrial activities in Scotland have been subject to increasingly strict regulation since the mid-1990s as a result of Scottish, UK and EU legislation and policy implementation. SEPA has been recording the mass emissions from the largest regulated sites since 2002 using its Scottish Pollutant Release Inventory (SPRI) which collates data for a wide range of pollutants.[72] Emissions from industry can be variable, as controls are typically set based on emission limit values (ELVs) from point sources (rather than mass emissions from the installation as a whole). As a result, emissions can fluctuate over time due to production needs, but still be in full compliance with permit conditions. A summary of the emission trends from SEPA-regulated sites since 2002 is included in the CAFS review emissions working group report.[73]

97. The provisions of this regulatory framework are wide-ranging, comprehensive and provide a good level of protection for the environment as a whole, using the principles of best available techniques (BAT). Therefore any scope for requiring further reductions of air pollutant emissions on a compulsory basis must be considered very carefully. Any environmental benefits must be balanced against costs of regulation (for both industry and SEPA) and a robust justification provided for additional controls. Nevertheless, SEPA is currently working with 15 sectors which partially or fully cover industrial emission sources to encourage them to move beyond compliance on a voluntary basis.

SEPA sector approach

98. SEPA can work with regulated business through sector plans to help drive improvement across environmental media as well as influencing circular economy choices. Air pollution is considered a cross-cutting issue in sector plans. By their nature, sector plans deal with issues which can contribute to emissions to air. For example, all sectors will use transport for materials, goods and people. This is likely to be the single largest source of uncontrolled emissions from any sector, on its own or in combination, for both air pollution and greenhouse gas emissions.

99. Sector-specific emissions of air pollution (such as point source releases, materials handling and fugitive emissions) are likely to be controlled through SEPA's existing regulatory tools such as permitting, inspection and enforcement (e.g. via Pollution Prevention and Control, and Waste Management Licensing). A core concept of industrial regulation in SEPA is continual improvement and, in most cases, mandatory environmental performance standards will drive any dynamic improvement on a cyclical basis. The sector plans will act as an additional focus, by providing enhanced clarity on pre-existing mandatory standards.

72 https://www.sepa.org.uk/environment/environmental-data/spri/

73 http://www.scottishairquality.scot/assets/documents/Emissions-Working-Group-Report.pdf

Beyond compliance

100. SEPA believe that those societies and economies that are low resource use, low energy use, low water use and low waste will be the most successful in the 21st century. Beyond compliance is about businesses choosing to go further than the environmental obligations that are placed upon them. These progressive businesses will view environmental excellence as an opportunity, not a problem. This can include looking at suppliers, auditing processes and evaluating buildings, fittings and equipment. SEPA will work with partners to support businesses that choose to implement these types of beyond compliance opportunities and achieve environmental, economic and social benefits. Many actions to reduce impacts on climate change, such as reducing fuel use or switching to alternative fuel sources, are often likely to be cost effective, and have co-benefits for outcomes such as improved air quality.

Non-exhaust emissions and Non-Road Mobile Machinery

101. Non-exhaust emissions (NEE) from road traffic are particles that arise from the wear of brakes, tyres and the road surface and from the resuspension of road dust.[74] NEE are significant contributors to particulate emissions from road transport, with particles from brake wear, tyre wear and road surface wear constituting 60% of primary PM2.5 and 73% of primary PM10 (by mass) from road transport.[75, 76] As exhaust emissions continue to decline, NEE will become an increasingly large component of emissions from transport.

102. Strategies to mitigate NEE from road traffic can be split broadly into traffic management, behaviours and legislation/standards. A number of opportunities exist for the Scottish Government to contribute into the emerging science of road traffic NEE during the life of CAFS 2.

103. Non-Road Mobile Machinery[77] (NRMM) covers construction plant, transportation refrigeration units (TRU), maintenance equipment and some agricultural machinery. NRMM does not utilise the Euro emission standards as adopted by vehicles. Rather, the UK Government introduced new legislation via the Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018,[78] where the most recent NRMM stage is Stage V.[79] However, not all NRMM machinery will comply with the Stage V level as they were manufactured before the 2018 Regulations were established.

104. In relation to construction NRMM, the Scottish Government will publish guidance based on existing industry-led guidelines such as the Supply Chain Sustainability School's Plant Charter[80] and the London NRMM guidelines. Guidance will focus on construction projects in AQMAs, cover construction NRMM with a net power rating of between 37kW and 560kW and seek to progressively tighten over time using the NRMM engine emission stages.

74 https://uk-air.defra.gov.uk/library/reports.php?report_id=992

75 It is worth noting the cautionary tone offered by the Air Quality Expert Group (AQEG) around NEE data, where they state that: "Quantitative data on the magnitude of non-exhaust emissions are sparse and highly uncertain…NEE emission factors used in inventories have a wide span of uncertainty – greater than a factor of two is typical – including considerable uncertainty in splits between PM10 and PM2.5 size fractions. The emission factors are also largely based on data from the 1990s and have not evolved as vehicle designs and fleet composition have changed, in contrast to the regularly updated factors used for exhaust emissions."

76 To place these figures into context, the NEE emission represent 7.4% and 8.5% respectively for all UK primary PM2.5 and PM10 emissions.

77 https://www.vehicle-certification-agency.gov.uk/other/non-road-mobile-mach.asp

78 http://www.legislation.gov.uk/uksi/2018/764/made

79 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691313/improving-air-quality-non-road-mobile-machinery-condoc.pdf

80 https://www.supplychainschool.co.uk/wp-content/uploads/2020/06/Plant-Charter-0420.pdf

105. Transport Refrigeration Unit (TRU) systems in light and heavy commercial vehicles are powered by either an auxiliary diesel unit or a direct belt drive linked to the vehicle engine. The NOx and PM emissions per kilometer travelled for TRUs are substantially poorer when compared to the Euro VI emissions from diesel vehicles exhausts.[81] One key challenge is that auxTRU diesel units can often be below the 19kW cut-off limit for compression-ignition engines in NRMM regulations[82] which means that they do not need to comply with any emissions standard.

106. There is no single legal, operational, behavioural or technological solution to reduce TRU emissions. Therefore, the Scottish Government will develop an emissions impact and evidence base on TRU emissions with research into emissions testing of TRUs to develop an applicable emissions factor, along with encouraging the use of direct drive electrically powered TRUs, collaborating with the UK Government to implement stricter emission standards on TRUs and encouraging the creation of TRU legal standards for new and existing vehicles.

107. Areas for possible further consideration include:

- the environmental benefit in bringing currently unregulated sectors (which have not been prescribed by EU legislation) such as non-waste anaerobic digestion into existing legal frameworks; and
- reviewing the current legal framework to investigate whether all appropriate industrial sectors are subject to regulation, to identify and remove legal gaps and ambiguities from legislation and investigate the use of general binding rules (GBRs) for ensuring compliance with codes of practice.

108. Even without taking these additional points into account, implementing EU requirements into domestic legislation has demonstrated that controls placed on industry are proportionate and effective in reducing emissions. Therefore, provided current EU requirements are maintained in Scotland following the UK's exit from the EU, further emissions reductions should be achievable, with additional benefits for air quality.

Waste incineration

109. Waste incineration, now commonly referred to as Energy from Waste, is strictly regulated in line with EU standards through the Pollution Prevention and Control Regulations. Under these regulations SEPA operates a rigorous permitting system for Energy from Waste operators. Our commitment to tackling the climate emergency and transitioning to a net-zero society by 2045 is unwavering. With this in mind, we have committed to review the role that incineration plays in Scotland's waste hierarchy, and are considering options to take forward this review. While this review is ongoing, we will continue to work with Energy from Waste operators and developers to consider opportunities to further improve the efficiency of plants. We will also consider how waste infrastructure can be future-proofed for Carbon Capture and Storage technology in line with recent Committee on Climate Change (CCC) recommendations.

81 https://www.airqualitynews.com/wp-content/uploads/2015/09/Liquid-Air-on-the-European-Highway.pdf and https://dearman.co.uk/wp-content/uploads/2018/09/Leeds-Dearman-auxTRU-report-2.3-Dissemination.pdf

82 http://content.tfl.gov.uk/auxiliary-temperature-reduction-units-in-the-greater-london-area.pdf

Actions

We will:

- Ensure that EU standards and principles relating to emissions of air pollutants continue to apply in Scotland following the UK's exit from the EU, in line with the duties introduced by the Continuity Act 2021.
- Utilise SEPA's sector plan approach to encourage businesses to go beyond compliance to achieve further reduction in air pollutants and greenhouse gas emissions.
- As part of the review of the Clean Air Act (see domestic burning actions), address the regulatory gap relating to stack height assessment for SEPA permitted sites.
- Explore opportunities across traffic management, behaviours and legislation/standards to reduce NEE from road traffic.
- Contribute into research to develop a consistent method of measuring NEE from road traffic, in order to improve the understanding of NEE emissions in Scotland.
- Engage with industry to produce guidance on requirements for gaseous and particulate emissions from NRMM.
- Develop an emission impact and evidence base on TRU emissions.
- Review the role of incineration in Scotland's waste hierarchy.

7.

Tackling Non-Transport Emissions Sources

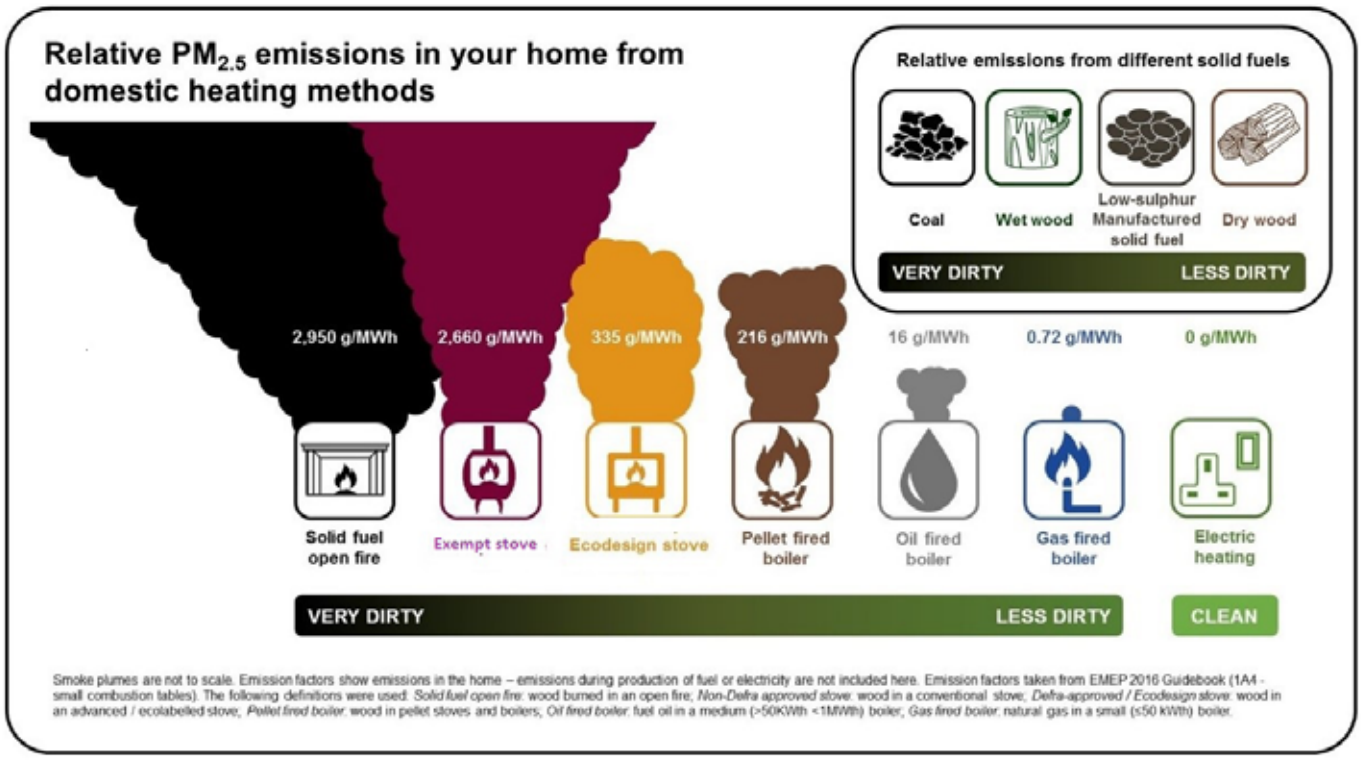
7. Tackling Non-Transport Emissions Sources

110. Although the contribution of all the major emissions sources to overall air pollution levels was highlighted in CAFS, the focus in terms of actions was very much on transport emissions. Whilst road transport in urban areas remains the issue of most concern in relation to air quality and its impact on human health, the CAFS review emphasised the need for a greater focus on other sectors, notably domestic (household) combustion and agriculture.

Domestic (household) combustion

111. The main pollutants of concern arising from domestic combustion are PM10, PM2.5, nitrogen dioxide and sulphur dioxide. A summary of domestic combustion emission sources, pollutants and trends in Scotland can be found in the CAFS review emissions working group report.

Figure 7: Relative emissions from different types of domestic appliance (Source: Defra)



112. The continuing uncertainty over emissions levels from domestic burning means that setting precise reduction targets is difficult. Further research into the proportion of emissions attributable to domestic burning, as well as assessment of type and source of emissions, is required. Further targeted monitoring of PM2.5 levels particularly in urban areas is desirable, subject to finding an agreed method of measurement. A further complicating factor is that around 50% of local ambient PM2.5 concentrations can relate to long-range transboundary transport from outwith Scotland.[83] This suggests that a consistent national, as opposed to local, approach will have a large impact on reducing domestic combustion emissions.

83 https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1910031755_DA_Air_Pollutant_Inventories_1990-2017_Issue_1.1.pdf

113. Actions to tackle domestic sources of air pollution need to be coordinated with related policies and actions, especially those included in the updated Climate Change Plan and those targeted at building standards and energy efficiency. The upcoming Heat Decarbonisation Policy Statement and updated Energy Efficient Scotland Routemap will set out our policy proposals and actions to drive down emissions from heating our homes and buildings. This is central to meeting the ambitious climate change targets set out in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (CAA). As well as delivering reductions in CO_2 emissions, these actions will also contribute to reduced air pollution by reducing the need for supplementary domestic heating. The Committee on Climate Change (CCC), which is the Scottish Government's statutory advisor on climate change, produced a report in 2018, Biomass in a Low Carbon Economy,[84] which explored how biomass could be prioritised for the most valuable end use. The CCC recommended a transition on the use of biomass towards construction and Bioenergy Carbon Capture and Storage (BECCS), with government support moving away from biomass boilers to heat buildings where there are other low carbon alternatives.

114. We know that 79% of households using solid mineral fuel in Scotland as their primary fuel type are in rural areas[85] and that around half of households (46%) using solid mineral fuels in Scotland are fuel poor compared to the national average of 25%. Emissions from burning wood depend on the type of appliance and the dryness of the wood. Other factors include the way the householder burns the wood and uses any appliance. Maintenance of the appliance and the chimney also have an impact, as do burning practices. For solid fuel, the amount of sulphur released depends on the sulphur content of the fuel.

115. Current legislation for controlling domestic combustion emissions derives from the Clean Air Act 1993 and associated regulations. This is based around the establishment of Smoke Control Areas (SCAs). Only appliances which have passed tests to demonstrate that they emit a minimal level of smoke are permitted for use in SCAs. Similar tests apply for fuels; only exempted fuels can be used in non permitted appliances. However the Clean Air Act provisions are becoming increasingly outdated and have little relevance to modern air quality legislation. This results in the anomaly that appliances and fuels may pass the SCA tests without necessarily being compliant with LAQM air quality objectives.

116. In addition, the provisions are difficult for local authorities to enforce and are poorly understood by members of the public. They also do nothing to address the impact of domestic combustion emissions outwith SCAs, nor the recent trend to install woodburning stoves in urban areas as a secondary or amenity heating source. The SCA approach is therefore, to a large extent, ineffective in ensuring that air pollution from domestic combustion is properly controlled.

117. At present flues, where they might constitute a material change, which form part of a domestic biomass system have permitted development rights (PDR). PDR means that for many/most such flues an application for planning permission is not required for their installation. PDR do not apply to flues located within an Air Quality Management Area, where they are attached to the principal elevation of a building in a conservation area or World Heritage Site, or if the flue projects more than one metre from the wall or roof. As the flue height to ensure dispersal of pollutants is likely to be unique to each installation, those flues that need to be taller than one metre from the wall or roof may require planning permission.

84 https://www.theccc.org.uk/publication/biomass-in-a-low-carbon-economy/

85 https://www.gov.scot/collections/scottish-house-condition-survey/

118. Whilst planning controls are wide-ranging, they cannot necessarily control specific aspects of technology and do not generally extend to works to the interior of buildings. The internal elements of the biomass system (including the furnace) do not require planning permission.[86] Planning permission is required for development, including material changes to the exterior of a building.

119. In the absence of appropriate control mechanisms it is difficult for local authorities to accurately assess the amount and location of appliances in their areas. In urban areas, it is often the cumulative effect of a number of appliances in a relatively small geographic area which makes a notable contribution to overall emissions, rather than emissions from an individual stove or fireplace, although locally it may be a single installation and its use which causes immediate concern for some residents.

120. Defra's Clean Air Strategy for England[87] sets out several proposals for addressing domestic combustion emissions that would also be of relevance in Scotland. The proposals cover both appliances and fuels, and focus on three key areas: the right appliance burning the right fuel, consumer education and proper installation/maintenance.

121. For appliances, the focus is on implementing and promoting Ecodesign,[88] the EU-wide programme to lower emissions and improve efficiency. The Ecodesign legislation forms part of retained EU law and will therefore continue to have effect after the UK's exit from the EU. Although the Ecodesign standards do not have legal effect until 2022, the stove industry has commenced initiatives to promote early uptake. The Stove Industry Alliance (SIA) is marketing Ecodesign Ready stoves, of which there are already over 400 models available, accounting for around 40% of current sales UK-wide. The SIA is also currently developing a scheme that will encourage appliance manufactures to produce appliances with even lower emissions than the Ecodesign requirements. Consumers will be able to clearly identify stoves with lower emissions than Ecodesign from the accreditation label. The PM limit in Ecodesign is 55% lower than in the current UK testing regime for exempting appliances for use in SCAs.

122. Ecodesign standards only apply to new appliances. Therefore a concerted effort is needed to encourage householders to replace their open fires and upgrade their existing stoves, given the significant emissions reductions that this will achieve (90% for open fires and, depending on the age of the appliance, up to 80% for stoves).

123. For fuels, additional support for local authorities can be provided by enforcing standards at point of sale rather than at point of use. Enforcement through trading standards in this way would mean retailers facing significantly greater scrutiny and detection of infringements. This approach can be further enhanced by restricting or banning the sale of the most polluting fuels, and ensuring that remaining fuels are produced and used in such a way that emissions are minimised. Setting a mandatory minimum renewables content for manufactured smokeless fuels could also have a positive impact on emissions.

86 Fundamentally, planning controls do not extend to works which affect only the interior a building or do not materially affect the external appearance of a building, except certain repairs to war damage or creation of underground space.

87 https://www.gov.uk/government/publications/clean-air-strategy-2019

88 https://op.europa.eu/en/publication-detail/-/publication/c6ccf626-2f6d-11e5-9f85-01aa75ed71a1/language-en

124. Reducing the moisture content of wood for burning is especially important in this context, with dried wood (less than 20% moisture content) having around 80% lower emissions than wet wood. Woodsure, the UK's woodfuel accreditation scheme, launched the Ready to Burn[89] scheme in 2017 which provides a certification mark to woodfuel suppliers who can demonstrate that the moisture content of their product is below 20%. Besides potential controls on the sale of wet wood, it will also be necessary to consider complementary approaches such as promoting locally produced and sustainable wood sources, alongside the benefits of seasoning by air drying. Such an approach could have wide-reaching positive impacts on Scotland's rural economy.

125. Regulatory control on its own will be insufficient to effect the necessary changes. Education for consumers is also important, both in terms of correct operation of appliances and using the right fuel for the appliance. Burnright[90] is an educational campaign which provides a range of materials and resources for stove users. Advice and support is also available to households looking to switch to a low-carbon heating solution via Home Energy Scotland.[91] Chimney sweeps are potentially well placed to play a key role in the educational process. A register of installers, engineers and sweeps who could report back on installations and advice given may be useful in this context, as could official recognition for trained and approved sweeps.

126. It is also important to consider the impact of non-domestic biomass emissions. In 2017 the Scottish Government published its energy strategy[92] which sets out a vision for energy production and use in Scotland to 2050. Meeting the ambitious targets set out in that strategy will require a range of energy sources to be utilised, including biomass.

127. In general, the larger the biomass unit, the easier it is to control the combustion conditions and therefore the easier it is to reduce the level of air pollution emissions. A single large boiler will tend to produce lower emissions than a series of smaller units using the same fuel and for the same energy output. It is more difficult to fit additional pollution abatement equipment to smaller units, and so emission reductions must rely on good boiler design, operation and maintenance. This lower size range includes most small-scale domestic wood burning stoves and boilers. Encouraging the use of plant scaled to make best use of available heat and biomass resource, for example in conjunction with the development of heat networks, will result in a system where air quality emissions are easier to control than from a larger number of small plant.

128. Where certain conditions are met, the impacts of biomass deployment for heat production can be managed to minimise impacts on local air quality. These conditions are:

- all new biomass plant are of high quality, corresponding to the best performing units currently on the market;
- the majority of biomass heat uptake replaces or displaces existing coal- and oil-fired heating;
- the majority of uptake is located off the gas grid and therefore generally away from densely populated urban areas; and
- levels of uptake where a local authority has declared an AQMA are substantially lower than other areas.

89 https://woodsure.co.uk/firewood-ready-to-burn/
90 https://burnright.co.uk/
91 https://energysavingtrust.org.uk/scotland/home-energy-scotland
92 https://www2.gov.scot/energystrategy

129. As conditions move away from this scenario, the adverse/negative impacts on air quality and public health increase significantly.

Actions

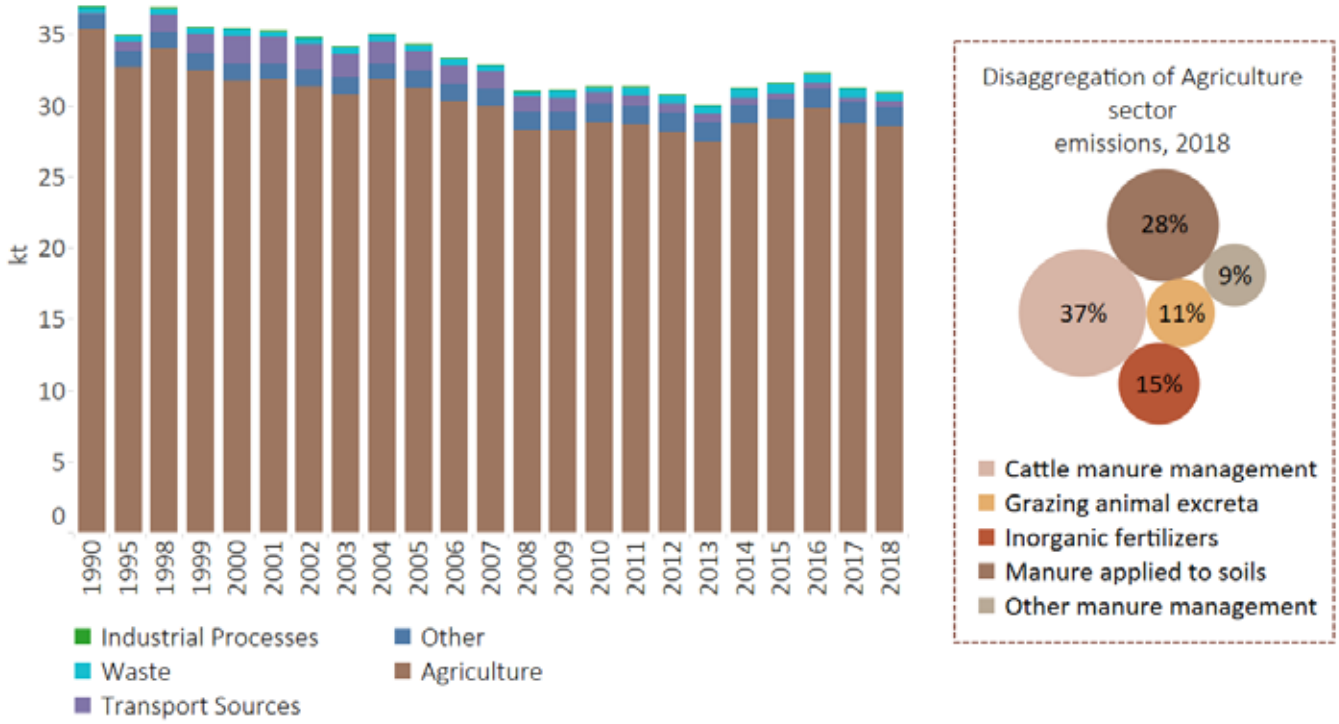
We will:

- Encourage uptake of Ecodesign stoves through Ecodesign Ready and other initiatives, along with consideration of how best to address widespread replacement of pre-Ecodesign appliances.
- Work with business and industry to support and further develop educational schemes such as Woodsure and Ready to Burn, including manufacturers, suppliers and users of both fuels and appliances.
- Take forward, working with businesses that may be affected and other interested parties, potential measures to control the supply of the most polluting domestic fuels – including a ban on house coal, restricting the sulphur content of smokeless fuels to 2%, prohibiting the sale of certain types of wet wood and introduction of a minimum renewables content for manufactured smokeless fuels. In taking forward this work, we are mindful that any new measures would require to be implemented over a period of time, such as a transitional period during which businesses could adapt to the new requirements without disproportionate costs.
- In developing policies and programmes to support households and businesses in transitioning to low-carbon heating solutions, we will consider the needs of those affected by any controls on the supply of the most polluting domestic fuels.
- Consider with local government what changes are needed to the current permitted development rights for flues for woodburning stoves and biomass boilers.
- Work with local government and SEPA to consider revision of the Clean Air Act 1993.
- Commission work to provide further evidence on the proportion of PM emissions and other key pollutants attributable to domestic burning in Scotland, together with geographic and demographic distribution of domestic burning.

Agriculture

130. Agricultural emissions related to air quality are dominated by ammonia (NH_3) and agriculture accounts for around 90% of total ammonia emissions in Scotland. Unlike emissions of the other main air pollutants, which have declined significantly over the last 30 years, ammonia levels have decreased by only around 12% in this period. Even this modest reduction has started to reverse slightly since 2012. Sources such as large intensive pig and poultry units above certain capacities are classed as industrial installations, and are regulated under the Industrial Emissions Directive and the Pollution Prevention and Control (Scotland) Regulations 2012.[93] However, there are currently no regulatory mechanisms in place in the UK for other agricultural ammonia emission sources, which make up the bulk of emissions. Further background on ammonia can be found in the report by the CAFS review emissions working group.

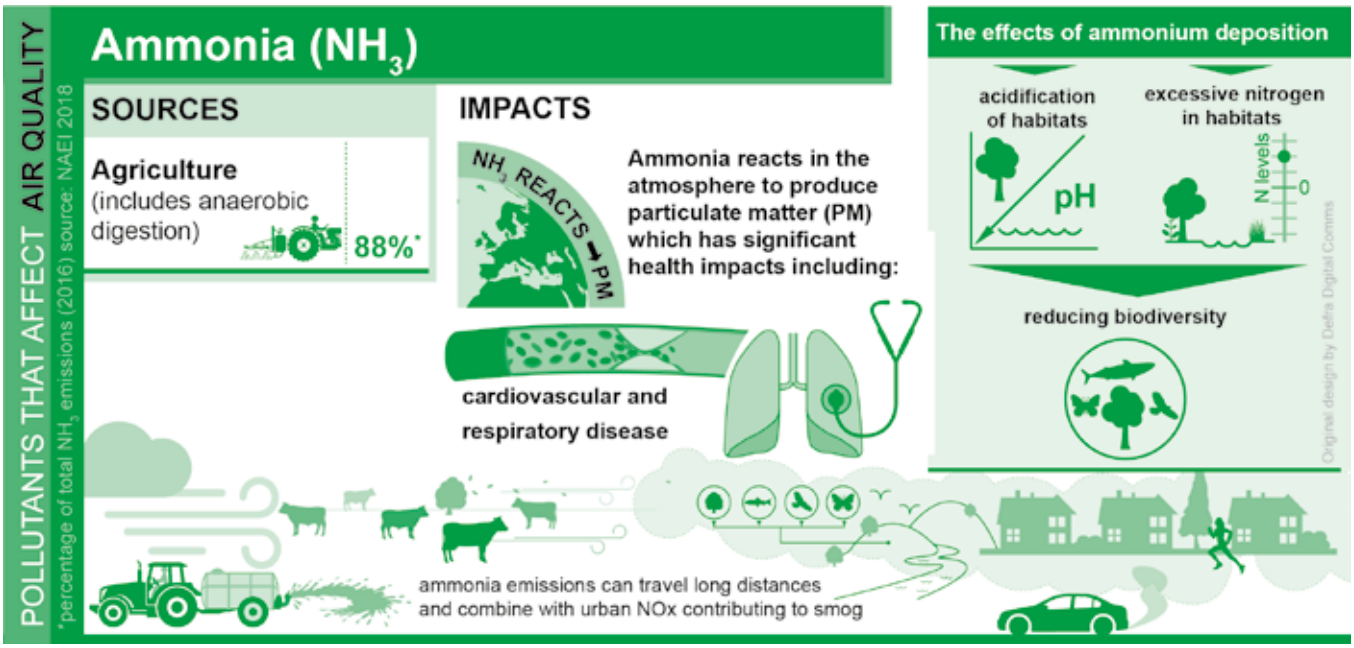
Figure 8: Changes in ammonia emissions in Scotland since 1990 (Source: National Atmospheric Emissions Inventory)



131. Ammonia is a nitrogen-based gas which is released when slurries, manures and nitrogen fertilisers come into contact with the air. It is very reactive and combines readily with acids and particulates. These chemical reaction products have a longer atmospheric lifetime, are harmful to human health and result in regional and long-range transport of nitrogen compounds. As air pollution does not stop at country boundaries, pollutants emitted both within Scotland and elsewhere can contribute to impacts a long distance away. The resulting pollution through ammonia and reaction products therefore occurs both close to sources and at greater distances (including remote areas of Scotland) through atmospheric dispersion and deposition onto sensitive vegetation. Nitrogen deposition (from both ammonia emissions and nitrogen oxides) effectively provides fertiliser from the air, leading to the eutrophication of our naturally nutrient-poor ecosystems and related damage to plant and animal species through eutrophication and acidification. Ammonia also produces odours and related nuisance effects, thereby impacting on both human and ecosystem health.

93 https://www.legislation.gov.uk/ssi/2012/360/contents

Figure 9: Ammonia sources and impacts (Source: Defra)



132. The most effective measures to reduce these impacts are those which directly reduce emissions of ammonia to the atmosphere, as opposed to attempting to introduce post-emission mitigation. Other emission mitigation strategies can also be useful and include physical separation of sensitive receptors from local sources through planning interventions (pre-emission) and the use of shelterbelts to enhance both dispersion through increasing turbulence and recapture of ammonia close to source (post-emission, secondary mitigation).

133. Ammonia, and therefore nitrogen content of fertiliser, can be lost whenever slurry or manure is exposed to the atmosphere; practices that reduce exposure in housing, storage or during application can therefore reduce losses and result in more efficient use. Retaining as much nitrogen as possible by reducing losses to the atmosphere or leaching into, for example, ground or surface water bodies will maximise nitrogen use efficiency and thus optimise returns on farm. However, care must be taken and measures will need to be carefully assessed for any potential pollution swapping, e.g. when reducing emissions to air may lead to increased leaching into ground water and eutrophication of water bodies.

134. The Gothenburg Protocol requires countries to produce a national advisory code of good agricultural practice to control ammonia emissions. Guidance was provided in the UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions[94] and in Options for Ammonia Mitigation from the Task Force on Reactive Nitrogen.[95] Therefore the development of such a code of practice within Scotland has been identified as requiring consideration. Although similar codes have either been or are being produced in other parts of the UK, Scotland's climate, soils, topography and agricultural practices will need to be considered to inform the development of any such Scottish guidance.

94 https://www.unece.org/index.php?id=41358
95 http://www.clrtap-tfrn.org/sites/clrtap-tfrn.org/files/documents/AGD_final_file.pdf

135. Recent work done on the health and environment impacts, and on the costs and benefits of ammonia reduction measures, by the Air Quality Expert Group[96] and others[97, 98] is a useful basis for considering the range of issues which needs to be covered. There is already good awareness on many farms of measures to improve nitrogen and wider nutrient use efficiency through good soil, fertiliser, manure and slurry management practices. However, increasing awareness and implementation of these measures can help to further reduce ammonia emissions. Given that the effects on human health and ecosystems/biodiversity of agricultural ammonia emissions and other pollutants have not received significant attention in air quality policy to date, there is a need to ensure that there is a strong focus on education, engagement and awareness raising around good practice.

136. While there are opportunities to deliver both emission reductions and improved business performance and sustainability through guidance, mitigation practices may require investment in infrastructure and new equipment, such as low emission slurry spreading equipment or covers for slurry storage. The Scottish Government has already taken action to support farmers to make such investments through the pilot Sustainable Agriculture Capital Grant Scheme.[99] The Scottish Government established five farmer-led groups to provide advice and proposals on action key agricultural sectors should take to cut emissions and tackle climate change, including considering how the agricultural industry can be strategically supported in the investments needed to transition to a sustainable low emission future, both in terms of ammonia and greenhouse gases. Their reports were made available in March 2021[100] and the detailed proposals and ideas within these reports are now being considered by government as it begins its work to create a new rural support scheme as required to do by statute by 2026.

137. Given the synergies between the practices that can mitigate ammonia emissions and greenhouse gases, it is clear that action must be considered as part of the wider work of the Climate Change Plan and its update in light of Scotland's new net zero greenhouse gas emissions targets. This strategy provides the framework for involving the agriculture and wider land management sectors in considering how to target these complex messages to farmers and agricultural contractors.

138. Related to the lack of direct policy focus, in Scotland until recently there has been little coverage of ammonia in the agricultural press. A productive approach to initial engagement with the sector could be to ensure that ammonia emissions feature prominently within farmer-focused messages on nutrient management and related good practice. The concept of retaining the nutrient value of manures and fertilisers coupled with messaging related to increased productivity and lower costs has helped to promote positive engagement and this should continue to be the case. It will also be important to recognise that, in addition to the direct gains that farmers achieve through reduced ammonia emissions, there is also a positive impact on human and environmental health.

96 https://uk-air.defra.gov.uk/assets/documents/reports/aqeg/2800829_Agricultural_emissions_vfinal2.pdf
97 https://www.rand.org/content/dam/rand/pubs/research_reports/RR2600/RR2695/RAND_RR2695.pdf
98 https://www.springer.com/gp/book/9789401797214
99 https://www.ruralpayments.org/topics/all-schemes/sustainable-agriculture-capital-grant-scheme--sacgs-/
100 https://www.gov.scot/policies/agriculture-and-the-environment/farmer-led-climate-change-groups/

139. The creation of a Scottish Nitrogen Balance Sheet (SNBS) will provide a baseline on Scotland's current nitrogen use efficiency, i.e. the proportion of nitrogen used for its intended purpose vs. losses to the environment, at the national scale. This baseline creates a new type of cross-sectoral evidence base that quantifies the uses and losses of nitrogen and enables identification of more and less nitrogen use-efficient processes, and will inform future decision making across a range of policy areas. These include agriculture, as well as transport, waste management and others. A national-scale SNBS will enable tracking of progress over time and dialogue to focus on policies that provide win-win outcomes rather than shifting nitrogen losses (with air quality and/or climate change impacts) within or between sectors. From the CAFS 2 perspective, the SNBS will be an important tool for assessing progress with ammonia reduction approaches to be included in the code of good practice for agriculture (as well as for progress with nitrogen emissions from combustion).

140. The fact that, almost uniquely amongst the main air pollutants, ammonia levels have not fallen significantly suggests that additional interventions are now required to address issues in the agriculture sector, through awareness raising and supporting farmers and crofters to take up best practice measures. This includes the need to ensure better management of fertiliser application and management in relation to dairy and beef as well as pig and poultry units, both in general terms and specifically where there is proximity to urban areas and sensitive ecosystems. Tackling these should also help to address odour complaints. Large intensive pig and poultry units are already regulated (see paragraph 118). These are sites which have a capacity of more than 40,000 poultry, 2,000 fattening pigs or 700 sows. Further consideration with the sector is required on options to reduce emissions from large scale units, including whether currently unregulated activities be brought into consideration in existing legal frameworks, alongside an improved understanding of the implications of these options.

141. In a wider agricultural context, the Muirburn Code[101] advises land managers and others on best practice and legislation regarding the use of fire as a land management tool. The Code, which was most recently updated in 2017, does not consider in detail the health and amenity impacts of visible smokes. This is an issue requiring further consideration.

101 https://www.nature.scot/professional-advice/land-and-sea-management/managing-land/upland-and-moorland/muirburn-code

Actions

We will:

- Continue to share best practice and raise awareness of air pollutants and greenhouse gases, along with actions that farmers and crofters can take to minimise their environmental impact while improving efficiency.
- Work directly with farmers, supported by scientific and economic expertise to co-develop new ways of working to better contribute towards delivering Scotland's climate change and environmental outcomes.
- Consider options to reduce emissions from large scale units in consultation with the agricultural sector, aligning with broader policy development around future rural support.
- Work together with SEPA and the agricultural industry to develop a voluntary code of good agricultural practice for improving air quality in Scotland.
- Undertake a specific assessment of visible smokes and their health and amenity impacts arising from Muirburn. The assessment will consider pollution characteristics and downwind impacts into populated areas, along with appropriate management responses and interventions.

Atmospheric nitrogen and environmental impacts

142. Compared with human health effects, the damage caused by air pollution on ecosystems may be less obvious and more difficult to identify on the ground (due to the specialist knowledge needed to identify symptoms and effects), and it remains important to disseminate knowledge on how to spot signs and raise awareness. Poor air quality and direct deposition of pollutants can cause damage to plants and animals, and to aquatic and terrestrial ecosystems, impacting on biodiversity through its contribution to eutrophication, acidification and otherwise damaging sensitive habitats. This can result in species loss, habitat composition changes and increased sensitivity of organisms to environmental stresses.

143. Eutrophication is caused by deposition of nitrogen oxides and ammonia. Nitrogen oxides can travel long distances in the atmosphere before being deposited, affecting upland and montane areas, while ammonia is shorter-lived and deposited closer to its source, more often affecting Scotland's lowland areas. Emissions of nitrogen oxides have decreased considerably since peaking in the period 1970-1990, and this has led to considerable decreases in nitrogen deposition across the UK. The far more modest emission reductions of ammonia since the 1980s have also contributed to deposition reductions, but to a lesser extent due to changes in atmospheric chemistry. These changes, largely due to the very successful mitigation of sulphur dioxide emissions from combustion processes, mean that the main result has been reduced exports of emissions to mainland Europe and decreased risk of acidification. Decreases in nitrogen deposition in the UK are mainly due to mitigation of emissions of nitrogen oxides both in the UK and Europe. Currently, critical loads for nitrogen (habitat-specific damage thresholds for atmospheric nitrogen deposition) are exceeded in 34% of habitats sensitive to eutrophication and 76% of Special Areas of Conservation in Scotland (SACS).[102]

144. The Nitrogen Futures project, which was published in autumn 2020 by the JNCC in partnership with the UK administrations and conservation agencies,[103] is bringing together available data on nitrogen emissions and estimating the environmental benefits of different possible policy options and ambition levels to reduce pollution. As part of this project, the research consortium tested possible local measures to reduce and mitigate nitrogen pollution, in the context of a 2030-2040+ time scale, for example:

- predict future atmospheric nitrogen emissions, concentrations, deposition and environmental impacts from the implementation of the NAPCP, including reduction in emissions from power generation and industry, and the use of catalytic reduction technology;
- introducing low emission 'buffer zones' for agricultural emissions around protected nature conservation sites;
- planting trees to recapture airborne nitrogen; and
- initiatives to target pollution from transport and combustion sources.

102 Trends Report 2020: Trends in critical load and critical level exceedances in the UK | Critical Loads and Dynamic Modelling (ceh.ac.uk)
103 https://jncc.gov.uk/our-work/nitrogen-futures/

Actions

We will:

- Use available data and other information to set a Scottish contribution for overall UK ammonia emissions reduction targets required under the National Emission Ceilings Directive.
- Support investigation into the method of assessing risk of significant harmful ecological effects from atmospheric nitrogen (nitrogen deposition and elevated concentrations of ammonia and NOx), comparing critical loads/levels with dose-response or other options.
- Assess the potential costs of implementing identified improvements to the current site condition monitoring of designated conservation sites, to improve on current methods which don't detect air pollution effects.
- Review current monitoring of terrestrial ecosystems (and air pollution effects) in Scotland.

8.

Transport

8. Transport

145. The overarching objectives of the Scottish Government's transport policy are: A Scotland that is connected by a sustainable, inclusive, safe and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors. A sustainable travel hierarchy that promotes both a reduction in the need to travel, a modal shift to minimise transport emissions and effectively manage demand to reduce the number of road-based vehicle movements.

National Transport Strategy

146. The National Transport Strategy (NTS2)[104] sets out an ambitious and compelling vision for Scotland's transport system for the next 20 years to protect our climate and improve lives. The transport sector's role in improving air quality is captured within the NTS2 'Take Climate Action' priority, given that "our current transport system is a significant contributor to poor air quality." The NTS2 'Reduces Inequalities' priority is also relevant in that everyone in Scotland will share in the benefits of a modern and accessible transport system that provides fair access, is easy to use and is affordable; these are vital if modal shift (and thus emissions reduction) is to be realised via the Sustainable Travel Hierarchy. The NTS2 states that: "we will design our transport system so that walking, cycling and public and shared transport take precedence ahead of private car use", utilising the Sustainable Travel Hierarchy and the Sustainable Investment Hierarchy.

147. In applying a sustainable travel hierarchy, we must:

- Manage demand and decrease absolute traffic levels by reducing vehicle journeys (particularly single occupancy private cars), rather than simply switching from the internal combustion engines (ICE) to ultra low or zero emission vehicles, as these do nothing to ease congestion and are still a source of particulate matter pollution directly from brake and tyre wear, road abrasion and indirectly road dust resuspension;
- Reduce the need to travel unsustainably, particularly drawing lessons from the COVID-19 emergency around flexible/home working and local work hubs;
- Utilise the 20 minute neighbourhood concept to co-locate homes, schools and everyday services, thereby reducing the need to travel;
- Enable a modal shift from private cars to mass transit at a faster pace than occurred in the 2010s, whilst reversing the decrease in public transport use observed during the COVID-19 pandemic;
- Reduce exhaust and non-exhaust emissions from all vehicles; and
- Ensure that technological and engineering solutions will make a difference in the real world.

104 https://www.transport.gov.scot/our-approach/national-transport-strategy/

148. The Sustainable Investment Hierarchy is embedded within the Strategic Transport Projects Review[105] which emphasises a reduction in the need to travel unsustainably, making the most of our existing transport strategic system and supporting strategic investments in sustainable, smart and cleaner transport options, in accordance with Just Transition principles.[106]

Low Emission Zones

149. Part 2 of the Transport (Scotland) Act 2019 confers new powers on local authorities in relation to the creation, and civil enforcement, of Low Emission Zones (LEZs).[107] This supports the Scottish Government's commitment to introduce LEZs into Glasgow, Edinburgh, Dundee and Aberdeen. LEZs set an environmental limit on certain road spaces and restrict entry to the most polluting vehicles with the aim of improving air quality in Scotland's city centres. Vehicles that do not meet the emission standards set for an LEZ will not be permitted to drive within the zone and a penalty charge will be payable by the vehicle's registered keeper, unless the vehicle is either out of scope of the LEZ or is exempt.[108, 109]

Figure 10: Low Emission Zones in Scotland (Source: Transport Scotland)

105 https://www.transport.gov.scot/publication/initial-appraisal-case-for-change-national-stpr2/
106 https://www.gov.scot/groups/just-transition-commission/
107 https://www.lowemissionzones.scot/
108 The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 (legislation.gov.uk)
109 The Low Emission Zones (Scotland) Regulations 2021 (legislation.gov.uk)

Actions

We will:

- Introduce LEZs into Scotland's four largest cities.
- Provide financial support to businesses and individuals most affected by the implementation of LEZs through schemes such as the LEZ Support Fund[110] and Scottish Bus Emissions Abatement Retrofit (BEAR) Fund.
- Publish regular updates on LEZ performance and continue to update the LEZ models to reflect changes associated with projects such as Spaces for People fund.
- Look at opportunities for promoting zero carbon city centres within the LEZ structure.

Avoiding unnecessary travel

150. In certain situations, the greenest mile is the mile not travelled. There is a role for employers to minimise emissions from staff commuting by promoting flexible, mobile and adaptive working (e.g. homeworking, flexible office spaces and local work hubs). There is also the wider issue of where we build new homes and services. Our future places need to be planned in a way that reduces the need to travel unsustainably, makes best use of existing transport infrastructure and builds in walking and wheeling as the most natural choice to get around as well as including nature-based solutions. The NPF4 position statement indicates that future policies will ensure that the NTS2 Sustainable Travel and Investment Hierarchies are embedded into development plans and proposals.

151. Transport Scotland has commissioned new research to build the evidence base on employers' attitudes towards working from home and their intended approach to employee travel as we exit from lockdown. This will help inform our thinking on how to support employers to encourage sustained home working as businesses recover from the pandemic. At the same time, it needs to be borne in mind that for many reasons people may be unable or unwilling to continue with home working in the longer-term, and also that there are jobs that cannot be done from home. Such jobs are often lower paid ones. The Fair Work Framework and Acas homeworking guidance offers tangible advice on how to incorporate homeworking into corporate carbon management planning.[111]

110 https://www.lowemissionzones.scot/support-fund
111 https://www.zerowastescotland.org.uk/save-energy-reduce-waste/carbon-management-plans

Actions

We will:

- Encourage all Scottish employers to apply the Acas homeworking principles (where practically possible) within their Carbon Management Plans.
- Ensure that public bodies will be exemplars in adopting this way of working, and should incorporate travel from employee commute as part of their corporate carbon footprint and will report these emissions via their public bodies duties reporting.

Active travel

152. The Active Travel Framework[112] 2019 sets out the key policies for improving the uptake of walking and cycling in Scotland. It builds on the Active Travel Vision that by 2030 Scotland's communities are shaped around people, with walking or cycling the most popular choice for shorter everyday journeys. The NTS2 states that Scotland's transport system will be designed with sufficient walking and cycling options. As well as the clear benefits for air quality and climate change, this shift to active modes will also have major benefits for improving health through greater levels of physical activity.

153. The Vision and Framework, along with the National Walking Strategy (NWS),[113, 114] set out clear ambitions for increasing the proportion of short journeys completed by walking or cycling. The Scottish Government has invested significant resources in improving walking and cycling infrastructure. In 2018, it doubled the funding for active travel from £39.2 million to £80 million, and increased this to over £100 million in 2020-21, as part of an overall £500 million commitment over the next five years. The figure for 2021-22 is £115.5 million. This funding supports various active travel schemes such as Places for Everyone[115] and Smarter Places, Smarter Choices.[116] In 2020, we delivered the 'Spaces for People' fund in response to the COVID-19 emergency, providing £39 million of funding and guidance to local authorities to quickly design and deliver the temporary walking and cycling infrastructure that was needed to enable people to physically distance.

112 https://www.transport.gov.scot/active-travel/active-travel-framework/
113 https://www.pathsforall.org.uk/mediaLibrary/other/english/81342.pdf
114 https://www.transport.gov.scot/publication/cycling-action-plan-for-scotland-2017-2020/
115 https://www.sustrans.org.uk/our-blog/projects/2019/scotland/places-for-everyone/
116 https://www.pathsforall.org.uk/active-travel/smarter-choices-smarter-places-1

Actions

We will:

- Work with local authorities and active travel partners to provide funding for permanent active travel infrastructure and behavioural change programmes, through grant funded programmes in line with the NTS Sustainable Travel Hierarchy and the Sustainable Investment Hierarchy, and where the projects are clearly aligned to the active travel outcomes framework.
- Work with local authorities and deliver partners to make temporary active travel infrastructure, delivered under the Space for People fund during the COVID-19 outbreak, permanent in the medium to longer term.
- Work collaboratively with partners to deliver our Active Travel vision of enabling walking, cycling and wheeling to be the most popular mode of travel for short, everyday journeys in our towns and cities

Bus

154. Bus services are arguably the single most important mode for reducing transport-related air pollution due to their central role in reducing congestion, improving journey time reliability, and as a key component of future Mobility as a Service (MaaS) solutions.

155. 75% of all public transport trips are taken by bus[117] but bus patronage has been dropping over a number of years and this must be reversed; bus must be positioned as one of the key tools in addressing air pollution from transport. Given that a single bus can take up to 75 private cars off our roads, the case for investment in bus priority infrastructure is strong. In 2019, the Scottish Government committed to investing over £500 million in such infrastructure – via the Bus Partnership Fund – to support local authorities, whilst also rolling out infrastructure for the trunk road network to prioritise high occupancy vehicles.

156. The Scottish Government also provides substantial financial support via the Bus Service Operators Grant (BSOG)[118] and concessionary fares, and established the Bus Decarbonisation Taskforce to co-design a pathway to a fully zero emission bus fleet. The Taskforce is comprised of leaders from the bus, energy and finance sectors and will set out the pathway to zero emissions by November 2021. The Scottish Government provided over £50 million to support the shift to zero emission buses in 2020-21 and has committed a further £120 million for the next five years. The Scottish Bus Emissions Abatement Retrofit programme also provides funding to licensed bus and coach operators, local authorities and community transport operators to retrofit existing mid-life buses to the Euro VI diesel standard (and thus make them LEZ-compliant).

117 Scottish Transport Statistics 2018, chapter 11 headlines.
118 https://www.transport.gov.scot/public-transport/buses/bus-services-operators-grant/

157. A new bus service improvement partnership model underpinned by the Transport (Scotland) Act 2019 may help support the leveraging of measures that support air quality improvements, via conditions associated with vehicles and services.

Actions

We will:

- Manage the Bus Partnership Fund to support local authorities to establish bus priority infrastructure and adapt the trunk road network to prioritise high occupancy vehicles.
- Support the transition to a fully zero emission bus fleet in tandem with preparing/retrofitting the applicable existing mid-life bus and coach fleet for LEZ compliance and air quality improvements.

Taxi and private hire

158. The taxi and private hire licensing regime is set within the Civic Government (Scotland) Act 1982, with supporting non-statutory best practice guidance from 2012.[119] The setting of taxi and private licensing conditions – including the setting of vehicle age limits and/or emission standards – in tandem with the collation and hosting of data is the responsibility of local authority licencing teams.

159. Compliance with LEZ emission standards is seeing taxi operators either upgrade to a zero emission taxi (supported by a Scottish Government interest free loan) or retrofit existing Euro 4 or 5 diesel taxis with new engines that are dual fuel and run predominantly on Liquefied Petroleum Gas to the Euro 6 standard (with help available from the Scottish Government LEZ Support Fund).

Actions

We will:

- Continue to support uptake of cleaner taxis through provision of LEZ funding.
- Ensure that taxi operations are incorporated into the drafting of 'LEZ Guidance', with cross reference to the 'Taxi and Private Hire Car Licensing' guidance.
- Explore the merits of a national taxi and private hire licencing database in terms of supporting the LEZ enforcement regime.

119 https://www2.gov.scot/Publications/2012/04/3534

Rail

160. The Rail Safety and Standards Board (RSSB) Air Quality Strategic Framework 2020[120] vision for the rail industry is: "a rail network with a minimal impact on local air quality." Collectively, the RSSB, train operating companies and Network Rail can improve air quality by actions that encompass modelling, retrofitting, idling, monitoring and collaboration. There is a natural fit between CAFS 2 and the RSSB framework to support delivery of tangible emission reduction from the rail industry in Scotland.

161. Localised problematic concentrations of air pollutants in large stations has seen Network Rail taken action to prevent unauthorised vehicles accessing the interior of prominent Scottish stations such as Glasgow Central and Edinburgh Waverley. The RSSB recommendations around monitoring and mitigation offer a natural starting point to reduce air pollution in large stations.

162. In July 2020, the Rail Decarbonisation Action Plan was published which sets out the plan to deliver against the Programme for Government commitment to decarbonise domestic passenger services in Scotland by 2035. This will be mainly delivered through a rolling programme of electrification, however, there will be some individual routes where the objective will be delivered through the use of alternative traction technology (hydrogen or battery). The resultant removal of diesel passenger services will minimise air pollution from trains.

163. There has also been investment in active travel provision through increased train and station cycle spaces, helping further encourage modal shift out-with the rail portion of journeys, in tandem with the rollout of integrated ticketing.[121]

Actions

We will:

- Ensure that the RSSB Air Quality Strategic Framework recommendations are supported and delivered where practicable in Scotland.

Zero tailpipe emissions

164. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 must act as a catalyst to link climate change and air quality policies wherever practicable, particularly given the suite of annual and interim emission reduction targets for the economy sector.

165. Significant progress has already been made in Scotland on zero emission vehicles. The Scottish Government has committed to expand the already comprehensive Charge Place Scotland network of over 1,250 public electric vehicle chargers across all parts of the country until 2022. This core network complements the growing provision of public charging provided by the private sector and builds increased consumer confidence in using electric vehicles.

120 https://www.rssb.co.uk/en/Research-and-Technology/Sustainability/Air-quality
121 https://smarttravel.scot/

166. The Scottish Government is working closely with public bodies and local authorities to improve low carbon infrastructure, promote behavioural change, and increase public access to low carbon technologies. Examples include:

- The Switched on Towns and Cities programme[122] enables local authorities to deliver infrastructure that supports EV uptake, with the aim to create at least 20 electric towns and cities across Scotland by 2025 to facilitate a step change in the uptake of plug-in electric vehicles.
- The Low Carbon Travel and Transport Challenge Fund supports public and third sectors to deliver low carbon transport and active travel hubs.
- The Switched on Fleets initiative supports local authorities and public bodies' transition of their vehicle fleets to zero emission alternatives, this includes electric and Hydrogen Fuel Cell vehicles.
- Supporting households in the transition to zero emission transport through interest-free Electric Vehicle Loan in tandem with funding towards the cost of installing domestic charge points for electric vehicles.

122 Switched on Towns and Cities Challenge Fund, https://www.transport.gov.scot/our-approach/environment/carbon-reduction-on-roads/switched-on-towns-and-cities-challenge-fund/

Actions

We will:

- Continue to support the uptake of zero emission vehicles by working with local authorities to bring forward innovative projects to incentivise battery electric and hydrogen vehicles, including through Switched on Towns and Cities programme and the Scottish Cities Alliance.
- Engage extensively on future financing and delivery models to support the growth in the public electric vehicle charging, including ChargePlace Scotland.
- Work across the public sector to accelerate the decarbonisation of vehicle fleets.

Lower carbon transport fuels

167. Significant change in behaviours and patterns of mobility is essential for decarbonising our transport system to support the net zero transition, as well as air quality improvement. However, considerable demand for powered vehicles will remain and we believe electrification – by various means – of the majority of vehicles on Scotland's roads to be the optimum solution, with maximum benefit for local air quality.

168. For some classes of vehicles however, electrification is simply more difficult, with market-ready options still some time away. There are also large numbers of petrol and diesel engine vehicles in use today with significant remaining lifespans. It is likely that lower carbon fuels such as waste – and sustainable biomass-derived fuels, or those from green hydrogen, will play a role in some transport sectors as we decarbonise. Some of these alternative fuels can also have some air quality benefits, burning inherently cleaner than diesel, so producing less NOx and particulates at the tailpipe. The extent of the role of alternative fuels in future transport will be clarified in the context of wider bioenergy policy choices, as well as the parallel development of other lower and zero emission drivetrain technologies.

169. Our policy approach to the production or use of lower carbon fuels has largely been focused on the UK-wide Renewable Transport Fuel Obligation (RTFO). Through that mechanism, lower carbon liquid fuels are already blended in increasing amounts into standard petrol and diesel road fuel supply chains. RTFO also supports other more advanced fuels like hydrogen and waste-derived biofuels. The Scottish Government welcomes the Department of Transport's current consideration of widening the scope of RTFO to more fully supporting advanced low carbon fuel markets.

Actions

We will:

- We will work to more fully understand the role of non-electrification routes to decarbonising transport – to lead to a better-defined wider policy position that complements existing electrification work streams. We will explore alternative fuels' potential to power certain vehicle types in the short-, medium- and long-term, whilst still contributing to Scotland's statutory climate change targets.

Freight

170. The movement of goods and services around Scotland is a vital component of the economy. Use of heavy goods vehicles to do this may still be the most appropriate mode in certain circumstances, particularly over longer distances, and should not be prevented in the right setting. A mix of spatial planning and logistic technology – in tandem with the emergence of zero or ultra low emission powertrains as market-ready affordable solutions – could help to optimise emissions from the heaviest vehicles in our fleet in the years to come.

171. The Scottish Parliament Environment, Climate Change & Land Reform Committee's Air Quality Inquiry in 2018[123] recognised the need to identify opportunities for maximising the efficiency of urban freight movements. One option could be the potential application of consolidation centres under the Local Government (Scotland) Act 1973[124] and the Local Government in Scotland Act 2003[125] that local authorities could use to create distribution hubs, at their discretion. Opportunities for distribution or consolidation hubs must be identified at a local level and must be industry-led in order for them to be commercially viable.

172. The public and private sectors must collaborate to identify effective pragmatic solutions that centre around the affordability of, and access to, zero and ultra low emission vehicles. This approach will help to decarbonise the freight fleet and improve air quality at the same time. We must also acknowledge that some freight operators may be tied into lease agreements that do not enable easy, quick alteration of their fleet profile within the timescales set by government to mitigate air pollution. Freight recognition schemes, such as ECO Stars,[126] can play a useful role here.

173. Zero emission light commercial vehicles, including e-cargo bikes, are emerging into the market and may offer more efficient and less harmful options for moving goods locally. Transition to such light commercial vehicles will be dependent on availability, lead-in times and cost/affordability (which links into the support element noted above). For e-cargo bikes, there is a natural alignment with the design and construction of active travel infrastructure. Important points to consider are engagement with industry and academia to examine options around, and barriers to, last mile and first mile deliveries, the potential impact of multiple smaller vehicles transporting goods on congestion; and the experiences of freight providers and retailers in coping with the surge in home deliveries during the COVID-19 emergency.

Actions

We will:

- Collaborate and engage with the freight industry and retailers to explore the options for, and the associated logistics of, 'last/first mile' delivery approaches.
- Collaborate with the private sector to identify effective pragmatic solutions on the uptake of zero and ultra low emission vehicles.

123 https://www.parliament.scot/parliamentarybusiness/CurrentCommittees/105527.aspx
124 https://www.legislation.gov.uk/ukpga/1973/65/contents
125 https://www.legislation.gov.uk/asp/2003/1/contents
126 ECO Stars – Fleet Recognition Scheme (ecostars-uk.com)

Trunk road network and demand management

174. The NTS2 clearly states that "we will not build infrastructure to cater for forecast unconstrained increases in traffic volumes" and acknowledges that not managing demand for car use is no longer an option. This means that capacity expansion of the trunk road and motorway networks will be de-prioritised over the next 20 years. Instead, the Scottish Government will focus on schemes encompassing safety, maintenance and network optimisation. The NTS2 also states that managing demand will include better public transport and more and improved active travel options, alongside a role to encourage people not to make unnecessary journeys.

Actions

We will:

- Work to revoke all Air Quality Management Areas, by meeting the required air quality objectives, where trunk roads are the primary contributor to air pollutants.
- Ensure that all trunk and local roads will comply with European Union air quality limit values.
- Explore how we can reallocate road space to cycling and pedestrians following learning from COVID-19 spaces for people scheme.

Intelligent Transport Systems

175. Intelligent Transport Systems (ITS) describe technology and communications used to improve efficiency and safety for transport users[127] and also encompass the growing field of connected and autonomous vehicles (CAVs). Transport Scotland's 'Future ITS Strategy' sets out our vision for the continued and evolving use of ITS solutions to support a safe and efficient trunk road network, with a specific focus on making traffic management decisions based on expected, modelled or measured pollution levels. Transport Scotland's 'A CAV Roadmap for Scotland' sets out a vision for how Scotland can be at the forefront of developments in the connected and autonomous vehicle industry and to put sustainable transport at the heart of decision making and ensure that transport plays a key role in delivering net zero emissions by 2045.

127 https://www.transport.gov.scot/media/40406/its-strategy-2017-final.pdf

176. In relation to air quality, ITS solutions could:

- ease congestion and smooth traffic flow;
- support low cost sensor deployment across a range of topics including local air pollution monitoring;
- support the design of traffic management technology deployment at potential pollution hotspots (including signalling; algorithms/strategies particularly at junctions with start/stop traffic flows);
- enabling localised pollution communication messaging to advise vehicle drivers around how their driving behaviours contribute to localised pollution;
- make active travel routes as attractive as possible by prioritising urban cycling corridors through harmonised traffic junction light settings;
- underpin the delivery of the LEZ back-office enforcement regime; and
- form a cornerstone in supporting the reallocation of road space and modal shift to public transport or active travel.

Workplace parking charges

177. Part 7 of the Transport (Scotland) Act 2019 focuses on a Workplace Parking Levy (WPL), providing local authorities with discretionary powers to implement a WPL scheme. WPLs can help to reduce congestion[128] and tackle climate/air emissions by influencing travel behaviour in a way that disincentivises private car use and encourages use of public and sustainable transport. However, it is a matter for employers on whether WPL scheme costs are passed onto employees.

178. For the purposes of improving air quality, local authorities that implement WPLs (and, in doing so, control the scheme design to determine geographical boundaries that might include, but should not be limited to, LEZs) should invest any proceeds from WPLs into more sustainable modes, to facilitate their local transport strategy.

Actions

We will:

- Take forward a policy consultation in advance of drafting WPL regulations, and thereafter, take forward the regulations required to support the WPL provisions in the Transport (Scotland) Act 2019 which require commencement and supporting regulations.

128 The SPICe report observed that 'Independent academic research into the impact of the Nottingham WPL on traffic congestion concluded that there is "...a statistically validated link between the introduction of a WPL and a reduction in congestion'. https://spice-spotlight.scot/2019/05/10/the-proposed-workplace-parking-levy/

Vehicle disposal schemes

179. Vehicle disposal schemes worldwide have historically applied a scrappage scheme to incentivise the registered keeper to trade in a used car/van for a new (ultra-low or zero emission) car/van. The Scottish Government introduced the LEZ Support Fund in 2019 as a form of vehicle disposal scheme to help those who will have the most difficulty in making the transition to the introduction of a LEZ. Rather than a conventional scrappage scheme, it provides targeted mobility grant funding for households (who currently use an LEZ-non-compliant private car) and micro-businesses using non-compliant light commercial vehicles. This approach seeks to encourage lower emission mobility options such as, but not limited to, e-bikes, bikes, public transport season ticket contributions and other incentives which reduce car ownership.

Actions

We will:

- Deliver a vehicle disposal programme in Scotland that is founded on the principle of emissions reduction.

Vehicle speed and air pollution

180. Speed impacts on emissions are influenced by a range of factors including driver behaviour, congestion, fuel type and engine technology including after-treatment devices. Emissions tend to plateau between 40mph and 60mph compared to much lower or higher speeds.

181. What is most important in terms of vehicle speed and emissions is the promotion of a smooth driving style that would see lower incidences of acceleration, deceleration, gear changing and braking in tandem with a reduction in 'stop/go' driving.

Measures requiring further investigation and research

182. Not all transport policies are devolved. However, there are opportunities for the UK administrations to collaborate including understanding how fiscal instruments such as fuel duty and vehicle excise duty could be altered to incorporate the costs to society from air pollution caused by transport. This might include examining how a charging/payment regime alternative to the existing fuel and road taxation-based structure.[129] How transport scheme design and operation can support COVID-19 recovery plans is also important.

129 https://infrastructurecommission.scot/storage/245/FullReport_200120.pdf

9.

Governance, Accountability and Delivery

9. Governance, Accountability and Delivery

183. Within both central and local government, air quality is a cross-cutting issue which has intricate connections with many other policy areas. It follows that, to deliver continued and sustained reductions in air pollution, there must be effective and consistent coordination across these policy areas. Although much progress has been made in this respect over recent years, the CAFS review made it clear that there is still more to do.

184. At central government level, the NTS2, NPF 4 and the updated Climate Change Plan will provide a clear, well-defined focus for building on achievements to date. In addition, the new National Nitrogen Balance Sheet (see para 21) will quantify nitrogen use efficiency and losses across all sectors of the economy and environment. At local level, positive developments could also be achieved through consideration of how to ensure better recognition and integration of air quality across the various disciplines to more effectively and efficiently deliver air pollution reductions and associated benefits.

185. Specific issues for consideration at local level include the extent to which local authorities have air quality policies within their development plans and/or guidance documents, how many City Deals have air quality objectives and initiatives and how widespread and effective joint authority working at the regional level is. This could result in shared learning for how local government engages, delivers, measures progress and gains credit for delivering change on air pollution.

Local Air Quality Management

186. The Local Air Quality Management (LAQM) system is the main focus for air quality action at the local and regional level. Under LAQM, local authorities are legally obliged to assess air quality in their area, designate Air Quality Management Areas (AQMAs) where objectives are at risk of or not being met, develop air quality action plans for dealing with the issues identified in AQMAs and report regularly on progress towards achieving compliance with the objectives.

187. The LAQM system has been periodically reviewed since its establishment across the UK in 1997, most recently in 2016 with the publication of revised policy and technical guidance and the introduction of a more streamlined approach to annual reporting. Although the monitoring and reporting aspects of LAQM continue to work effectively, with a large, comprehensive body of air quality data available covering Scotland over a number of years, the CAFS review suggested that air quality objectives could be made to apply in all places with public access (as is the case for EU air quality standards) as opposed to the current approach which restricts application to places where members of the public have regular access. This could potentially increase the level of human health and future land use protection delivered by LAQM and also simplify the communication of air quality issues.

188. Currently, there is an inconsistency in the level of protection from air pollution afforded to people depending on their location. Much greater weight is given to residential settings as opposed to other settings with public exposure with, generally speaking, higher thresholds set for the latter. There is also a disconnect between environmental health and health and safety legislation. Taken together, these two disparities mean that individuals are often subject to air quality in the workplace, or when shopping or partaking in leisure activities, that would not be permitted in a domestic context. In many ways, this is a legacy of estimating exposure based on the fixed monitoring network and modelled estimates, due to the difficulties of taking into account people's mobility. As the body of data on mobility continues to grow, and the technology to make use of these data continues to develop, we need to consider how we can better match policy and guidance to the ways in which individuals actually move about in and interact with a variety of spaces.

189. In addition, the review highlighted some ways in which action planning could be made to work more effectively. At present, there is no standardised format for action plans in the way there is for annual reports. There is also no systematic approach to reporting on progress with implementing action plan measures or reviewing overall plans, nor for setting and agreeing target dates and timelines. Local authorities are not legally required to achieve the air quality objectives but simply demonstrate they are doing all that is reasonably possible to work towards them, mainly because some sources of air pollution are outwith direct local control such as SEPA controlled processes and trunk roads managed by Transport Scotland. This means that any obligation to complete action plan measures to specific timescales will need to be delivered through guidance rather than legislation.

Actions

We will:

- Assess the advantages and disadvantages of extending LAQM assessment to all areas with public access, to provide the necessary evidence base on which to make a decision on whether this would deliver overall benefits.
- Undertake a further revision of the LAQM policy guidance to take account of developments since the last update in 2016.
- Develop a more systematic approach to action plan production and implementation, including a standardised format and a methodology for agreeing and setting defined timescales for completing individual measures, revoking AQMAs and reporting progress.

Governance

190. There was no formal role for the Scottish ministers in the governance structure for CAFS, a gap highlighted by the independent review. The Ministerial Leadership Group, which was established to oversee Low Emission Zone delivery in Scotland's four biggest cities, has proved to be effective in ensuring that high level accountability is in place, with a clear link to delivery bodies. An air quality Ministerial Group will be led by the Cabinet Secretary for Net Zero, Energy & Transport, and the Minister for Environment, Biodiversity & Land Reform. Additional membership will comprise ministers from other portfolios for consideration of specific issues (e.g. health, planning, agriculture), senior central and local government representatives, government agencies and external advisors. This would provide for

greater partnership working between central and local government and across the relevant portfolios. The Ministerial Group will meet at least once a year and will be serviced by a secretariat to bring and take advice and action reports, as well as escalate action delivery and performance issues.

191. Transparency and public accountability are essential. Visible authority and leadership at ministerial level is a key component of this, as is an implementation structure within which it is clear who is responsible for what and the steps that can and will be taken to drive delivery. The Governance Group which oversaw CAFS will be renamed the CAFS 2 Delivery Group. The Delivery Group will be chaired by the Scottish Government, and the membership will reflect the scope and priorities of the new strategy. The Group will be directly accountable to the Ministerial Group and will be provided with a clear remit, including the authority and defined procedures to ensure that the actions in the new strategy are effectively delivered, and a description of how its advice is conveyed to the Scottish ministers. The Delivery Group will also need clear targets and KPIs.

192. The Delivery Group will in turn be supported by specialist subgroups which will meet on an ad hoc basis. The subgroups will provide advice and recommendations on delivery of CAFS 2 actions and provide any other input to the Delivery Group which that group requires or otherwise deems appropriate. The topics covered by the subgroups are likely to be wide-ranging, covering, in particular, climate change, agriculture, placemaking, human health, industry, transport and the natural environment.

193. In order to objectively judge the effectiveness of this delivery structure, a complementary reporting mechanism will be required. Building on the model of the annual progress reports produced for CAFS, there needs to be a simple line of sight from strategy to planning, through delivery and ownership of actions to ultimate accountability. All of this will be reflected in a revised and strengthened annual performance report which will be approved by ministers and submitted to Parliament.

Actions

We will:

- Establish a Ministerial Group to provide high level leadership and direction for CAFS 2.
- Establish a Delivery Group with a clear remit and well defined responsibilities for ensuring that the actions in CAFS 2 are delivered.
- Establish a series of specialist groups to provide advice to and support the work of the Delivery Group.
- Produce an enhanced and strengthened annual performance report documenting progress in implementing CAFS 2.

10.

Further Progress Review

10. Further Progress Review

194. Air pollution is a complex multi-dimensional issue. Whilst good progress has been made, a lot remains to be done with, in some cases, potentially significant financial and societal implications. The costs of not taking further action will continue to impact us all, however, in terms of negative health impacts, congestion, public safety, loss of amenity, climate change and a failure to maximise the potential for better quality of life and ultimately improved economic performance. Such failure will only serve to further exacerbate health inequalities and overall risks to public health for much of the population, besides having wider implications for efforts to tackle the global climate emergency.

195. For these reasons it is important that, whilst focusing on delivery of CAFS 2 over the short- to medium-term, we must also have an eye on the bigger picture and identification of additional priorities in the coming decades. There are two elements to this; refinement and retargeting of actions and policies as new evidence on the health and environmental impacts of poor air quality comes to light, and continued alignment with other long-term policies, notably the commitment to net zero greenhouse gas emissions by 2045. As with the original strategy, CAFS 2 will therefore have a five year life cycle.

Actions

We will:

- Initiate a review on progress with implementing CAFS 2 during 2024, with a view to having a further version of Scotland's air quality strategy in place by the end of 2025.

Impact Assessments

196. Ensuring that there are no negative equalities or business impacts from this strategy is a key part of its implementation. Therefore, an Equality Impact Assessment (EQIA) and a Business and Regulatory Impact Assessment (BRIA) have been prepared to accompany the strategy. These documents examine where possible inequalities and business impacts could occur, and will help us ensure that any negative impacts will be avoided. Any regulations which follow on to support the actions in CAFS 2 will be required to undergo further impact assessments.

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