Extrium

REPORT COMMISSIONED BY THE

WELSH GOVERNMENT

AN UPDATE OF THE SYNERGIES AND CONFLICTS BETWEEN AIR QUALITY AND NOISE

23 December 2019

REPORT

Reference	P065_17
Title	An Update of the Synergies and Conflicts Between Air Quality and Noise
Version	Final
Date	23 December 2019
Prepared for	Dr Martin McVay Policy Advisor (Noise, Chemicals and Local Air Quality) Welsh Government Cathays Park Cardiff, CF10 3NQ
Prepared by	Nigel Jones (Director, Extrium) Matthew Burdett (Assoc. Director., Extrium) Simon Shilton (Director, Acustica) Dr Richard Maggs (Consulting Group Manager, BVUK) Stephen Moorcroft (Director, Air Quality Consultants)
Reviewed by	Nigel Jones (Director) Dr Richard Maggs (Consulting Group Manager) Stephen Moorcroft (Director, Air Quality Consultants)
Approved by	 Nigel Jones (Director)

REPORT STATEMENT

Extrium has led the completion of this report with all reasonable skill and care and with an understanding of the aims, objectives and scope of the work as made available to Extrium at the time of preparation.

This report is issued to the Welsh Government under agreed contract. Extrium does not accept any responsibility to any third party to whom this report may be circulated, in part or in full, or for any matters arising which may be considered outside the scope of works. Any such parties rely on the contents of this report solely at their own risk.

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

Extrium, working in conjunction with Acustica, Air Quality Consultants and Bureau Veritas UK (the Consultants), has been commissioned by the Welsh Government under the terms of the Noise Mapping and Action Planning Contract (ref: C195/2015/2016) to undertake a review of the report "*Determination of the Potential Synergies and Conflicts Between Noise and Air Quality Action Plans*", authored by Atkins in 2001 (2001 Report).

Following a number of years in which air quality and noise policy have been implemented in largely separate regimes, this review is timed to coincide with a number of policy and technical developments which signal a closer alignment in the future.

The 2001 Report was originally commissioned by the then Department of the Environment, Transport and the Regions (DETR) on behalf of the then Department of Environment Northern Ireland (DoENI), the then Scottish Executive (SE) and the National Assembly for Wales (NAW).

With the emphasis being placed on approaches in Wales, this review focusses on the main air quality and noise sources of interest to action planning in Wales; namely road traffic, railways and industrial sources. Aviation noise and air pollution are not included in this review.

1.2 AIM

The aim of this report is to undertake a review of the synergies and conflicts associated with road traffic, railway and industrial noise sources set out in the report "*Determination of the Potential Synergies and Conflicts Between Noise and Air Quality Action Plans"* (Atkins, 2001) against the contemporary regulatory environment and technical landscape.

1.3 OBJECTIVES

The objectives of this review are:

1. To assess changes to, and developments in, the Local Air Quality Management (LAQM) and Environmental Noise Directive (END) related air quality and noise action planning regimes in the UK since the 2001 report;

2. To identify relevant classification schedules of air quality mitigation measures and to develop a new consolidated air quality and noise mitigation measures list;

3. To review the mitigation measures in the 2001 Report in the context of the consolidated measures schedule and undertake an updated evaluation of synergies and conflicts associated with each of the measures in the new consolidated measures schedule;

4. To identify and report examples of current research and best practice associated with combined air quality and noise action planning;

5. To consider potential ways in which the planning process in Wales might be further developed to better support combined air quality and noise/soundscape assessments;

6. To set out conclusions from the work; and

7. To outline recommendations for the further integration of air quality and noise action planning.

2 EVOLUTION FOLLOWING THE 2001 REPORT

The 2001 Report was commissioned in 2000 and published in 2001. The aims of the 2001 Report therefore reflect the political and technical environment of that time. Devolution and regulatory powers for the Devolved Administrations was in the early stages at the time of the 2001 Report with environmental policy being developed on a UK wide basis.

The 2001 Report was commissioned shortly after the introduction of the Local Air Quality Management (LAQM) regime in the UK and during the early years of the European Directives on air quality management, where Framework and Daughter Directives were adopted (they were subsequently consolidated into the Ambient Air Quality Directive of 2008). The first 'cycle' of local authority "review and assessment" under the LAQM regime was coming to a conclusion with the declaration of air quality management areas (AQMAs), giving rise to the formulation of the first local air quality action plans (AQAPs).

The 2001 Report also pre-dated the adoption of Directive 2002/49/EC relating to the assessment and management of environmental noise - commonly referred to as the Environmental Noise Directive (END) - and five years ahead of the transposition of the END into law across the UK. The END would require strategic noise maps to be produced for the first time in 2007 with noise action plans (NAPs) being required to be developed the following year.

At the time, local authorities were leading on LAQM and it was thought likely that they would also play a significant role in the development of strategic noise maps and subsequent noise action plans. The anticipated future close relationship between air quality and noise action planning gave rise to the interest in understanding whether air quality and noise mitigation measures might enjoy a degree of synergy, or whether certain measures might conflict. The 2001 Report, reflecting this thinking, sought to focus on measures "..which could potentially be implemented by local authorities..".

From our position today, we can see that the political and technical landscape today is very different to that of 2001. Wider changes across the UK, along with developments in air quality and noise policy, have led to a very different approach to the way in which air quality and noise action planning was anticipated at the time of the 2001 Report.

Perhaps the most significant changes have come about as a consequence of devolution; however the economic events of the last decade and significant changes in technology (especially in computing and increased availability of data) have also influenced the evolution of air quality and noise action planning. Further advances in the knowledge and understanding of the health impacts of air pollution have raised air quality up the political agenda with the

UK Government publishing a Clean Air Strategy in 2019[1]. Following the UK's decision to exit the European Union there is a possible opportunity to shape environmental policy in a more flexible way.

In respect of air quality and EU compliance, recent years have seen Government fail in its defence of legal challenges on its ability to achieve compliance with EU limit values. The drivers to achieve improvements in both disciplines are therefore much greater than at the time of the 2001 Report being undertaken.

The following sections further assess the changes to and development in air quality and noise action planning regimes since the 2001 Report.

2.1 THE EVOLUTION OF THE LAQM REGIME

2.1.1 Initial Regime

The Local Air Quality Management regime came into effect through Part IV of the Environment Act 1995 for Wales, Scotland and England. In Northern Ireland the regime was not to come into force until 2002 through Part III of the Environment (NI) Order 2002. At the time of adoption the key facets of the regimes were:

1. Identification and screening of emission sources of pollutants relative to the risk of non-compliance with air quality standards

2. Declaration of air quality management areas (AQMAs) where non-compliance with air quality standards was identified, or where the exceedance of an air quality standard was likely to be encountered (this taking into account the yearly variability in pollutant levels and their dependence on weather conditions at the time of release).

3. For an AQMA – or a set of AQMAs - the development of a local air quality action plan (AQAP), which would set out the measures identified by the Council that would be implemented in order to bring the air pollutant levels down an into compliance

4. Consultation with relevant stakeholders regarding the formulation of the air quality action plan, prior to adoption.

An initial three yearly cycle of "review and assessment" was set, with local authorities reporting the initial screening approach – the Updating and Screening Assessment (USA) prior to stepping through with Detailed and Further Assessments, which informed the subsequent focus on the air quality action plan, where such a plan was identified as being required.

[1] https://www.gov.uk/government/publications/clean-air-strategy-2019

The first round of assessment under the LAQM regime commenced in 1998 for all areas other than Northern Ireland. Guidance was provided initially through separate Technical Guidance documents covering the various themes of the technical appraisal – monitoring, emissions, modelling – along with additional policy guidance.

In respect of air quality action planning, a reluctance to be overly prescriptive in measures that could be adopted by local authorities meant that little guidance was provided in respect of air quality action planning at the time. Nonetheless, some steer was provided in respect of what an acceptable action plan should consider. That is:

- The need for the air quality action plan should be clearly stated;
- Source apportionment of emission sources leading to the extent of the problem should be clearly conveyed, in order to inform the focus of the action plan;
- All measures should be considered and reasons stated for those that are not carried forward for implementation either through cost or feasibility;
- In order to justify the local authority's decision on measures to be implemented a simple cost benefit analysis should be undertaken;
- Timescales for implementation should be set;
- The benefits of implementing the measures should be clearly articulated in respect of anticipated improvements in air quality; and
- Wider non-air quality impacts should be derived in order to ensure the viability of implementing the measure(s). The "synergies and conflicts" with other environmental quality objectives – such as noise in the case of the 2001 Report – and latterly with climate change objectives. In this way, a potential "win-win" in implementation of the air quality measures should be achieved. This is the basis of the 2001 Report, in the two key policy areas of air quality and noise at a time when the needs of the Environmental Noise Directive were being transposed in UK law.

In the intervening years an increased level of guidance has been provided in respect of the measures that could be implemented within AQMAs to improve air quality with policy guidance in England and Scotland providing measure-by-measure considerations. For Wales, policy guidance is not explicit in respect of action planning but does clearly set out the expectation of how councils in Wales should work under the framework of air quality management to achieve improvements.

The LAQM regime has now been active in the UK for some 20+ years and resulted in an increased knowledge and understanding of emissions and air pollutant dispersal at the local level.

Road transport-related non-compliance with the air quality standards for nitrogen dioxide (NO_2) is by far the biggest challenge faced by local authorities in their LAQM duties.

The following table provides a summary of the current AQMA status across the UK by pollutant.

Table 1. Current number of AQMAs by pollutant[2] (as of 30 April 2019)

Pollutant	England	Wales	Scotland	N. Ireland	London
Benzene					
Nitrogen dioxide NO_2	515	43	29	16	34
Particulate Matter PM_{10}	40	1	19	3	29
Sulphur dioxide SO_2	5		1		

Note this table does not provide a total count for the number of AQMAs declared. It is a count of the number of AQMAs declared for each pollutant. For example where an AQMA has been declared for both NO_2 and PM_{10} it will have two entries in the above table.

(Note: The air quality objective for PM_{10} in Scotland is more stringent than for the rest of the UK.)

Whilst the LAQM regime has arguably been very successful in diagnosing problems in local air quality – leading to the declaration of AQMAs – the resultant need to improve air quality has been less successful. Moreover, the wider impacts of implementing air quality improvement policy – relative to the synergies and conflicts with other priority policy areas – has, to a greater degree, been lost. As a result, reviews of the LAQM regime have taken place across the UK – set against the increased flexibility attributed to devolved administrations to diverge from specific requirements of the UK-wide regime.

Public information and health outcomes have featured more heavily in the LAQM regime in recent years, acknowledging the increasing concern around air pollution levels across all of the UK. In all areas of the UK where new revised statutory reporting requirements have been set a public facing summary of air quality within the local authority's area now forms the cornerstone of the work.

[2] https://uk-air.defra.gov.uk/aqma/summary

Typically avoiding the use of technical language the public facing summary seeks to send a simple summary of the current status of air pollution in the local council's area, and updates the public on what the council is currently doing to improve it. The annual report tracks progress on the implementation of air quality action plan measures although this does not extend to any explicit consideration to synergies or conflicts with other environmental parameters such as noise, climate change, etc.

One area of focus in wider considerations is the potential win-win outcomes in respect of public health. In Wales, the Public Health Outcomes Framework for Wales highlights the extent to which air quality needs to be taken into account in health improvements with links made to the Well-being of Future Generations (Wales) Act 2015[3] ("the WFG Act"). Similar health outcome frameworks exist in England, Scotland and Northern Ireland.

The current consideration to the synergies and conflicts of air quality mitigation and noise mitigation measures represents a timely refresh of the 2001 analysis set against the movements in the LAQM regime that have strengthened links with other policy areas, more effective public communication on air quality, and win-win outcomes for the public.

2.1.2 Current AQ Action Planning

The preceding section has shown that challenges on improving air quality across the UK still exist; more so than the challenge of identifying the problem. In part, this has been due to road transport being the main cause of air pollutant non-compliance in the UK. The VW emissions scandal highlighted that certain manufacturers were by-passing laboratory tests relative to the extent of emissions arising under "real-world" driving conditions. Moreover, the benefits of increasingly stringent Euro standards for vehicles have not been realised to the full extent – in part, due to disconnect between laboratory emissions test cycles and the real-world driving conditions.

In recent years the UK has seen increased media attention and litigation on the theme of air pollution. The two are closely linked. That is, without the latter the former would only garner certain attention from medical studies linking cause and effect between air pollution and adverse health outcomes. As it is, government has three times now failed in the UK courts (High Court[4] and Supreme Court[5]) to defend its stance on continued non-compliance with legally binding EU limit values for NO_2. As a result, a National Plan[6] for Roadside NO_2 compliance has been developed for England, whilst both

[3] http://www.legislation.gov.uk/anaw/2015/2/contents/enacted
[4] https://www.blackstonechambers.com/news/rclientearth-no-2-v-secretary-state-environment-food-and-rural-affairs/
[5] https://www.supremecourt.uk/cases/uksc-2012-0179.html
[6] https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

Scottish and Welsh Governments are having to additionally implement plans to achieve NO_2 limit values in the shortest possible period. Some consideration to the costs and benefits of implementing these plans is being done at the local level and Public Health England have published a 'Review of interventions to improve outdoor air quality and public health'[7]; however there remains no clear guidance in respect of what wider non-air quality benefits may arise with other policy areas, or what the dis-benefits on other policy areas may be.

A consultation[8] exercise on the implementation of NO_2 plans in Wales closed in June 2018. WelTAG Stage 1 appraised the long list of 57 measures against the key criteria for meeting the objective of the local plan in each area. A final plan was published in November 2018[9], which supplements the national plan for achieving compliance with EU limit values. In England, Clean Air Zones (CAZs) form the cornerstone of the NO_2 plan and this also forms a consideration in the NO_2 plan for Wales. Further initiatives in England supporting the reduction in levels of NO_2 include the Road Investment Strategy operated by Highways England, the Clean Air Fund and the Ultra Low Emissions Zone in London.

In the final plan for Wales consideration is made to the wider effects on public health and the natural environment, including noise.

The plan itself does not go on to elaborate on the context but it is clear that the policy driver of the WFG Act seeds the basis on acknowledging that this must form a wider aspect of the NO_2 plan during more detailed considerations prior to implementation. The links between the NO_2 roadside plan and the need for local council co-operation in implementing them, and the associated success of them, are drawn together in Section 85 of Part IV of the Environment Act 1995, which afford "reserved powers" for Ministers regarding directing relevant local authorities in their duties to improve air quality in designated areas where air quality standards are not met, or there remains a likelihood of prolonged exceedance through the local authority not progressing suitably with the implementation of their action plan measures.

2.1.3 Wales

Local authorities in Wales are guided in their LAQM duties by Welsh-specific policy guidance[10] and are required to report progress against their review and assessment duties using a specific Annual Progress Report (APR) for Wales[11]. The UK-wide LAQM Technical Guidance LAQM.TG16[12]

[7] https://www.gov.uk/government/publications/improving-outdoor-air-quality-and-health-review-of-interventions
[8] https://gov.wales/tackling-roadside-nitrogen-dioxide-concentrations-wales
[9] https://gov.wales/air-quality-plan
[10] https://gov.wales/air-quality-management-guidance-local-authorities
[11] https://laqm.defra.gov.uk/assets/APR_Template_Wales_2019_v1.doc?v2

(LAQM.TG16) was most recently revised in February 2018 primarily in light of the Welsh LAQM framework.

In undertaking their duties the Welsh Government has asked that councils adopt the fives ways of working as set out in the WFG Act. Namely:

1. pursuing long-term, enduring solutions to any existing instances of non-compliance with the national air quality objectives;

2. seeking to manage air quality at the same time as achieving other, related outcomes;

3. taking every opportunity to talk to the public about air quality challenges, listen to their concerns and seek their views on potential solutions and their involvement in delivering them;

4. working actively with internal and external partners to mutual benefit in the delivery of desired outcomes; and

5. keeping exposure to air pollution as low as reasonably practicable across the whole of the population, looking out in particular for areas where the national air quality objectives might be at risk of being breached at some point in the future and acting pre-emptively to prevent those breaches from occurring.

The LAQM regime as a consequence is therefore more ambitious than merely achieving compliance against the breaches of national air quality standards. As a matter of principle, and through following the sustainability framework within the WFG Act (and associated guidance) it is hoped that local authorities achieving improvements in air quality, will do so to the wider benefit of the local community and the Welsh economy and achieve positive win-win outcomes against other policy areas.

For Wales, the picture of AQMAs declared by emission source mirrors the national picture of focus on road transport. Currently, there are some 44 AQMAs declared in Wales with 43 of these being focused on the need to comply with breaches of the annual mean nitrogen dioxide (NO_2) objective.

Neath Port Talbot County Borough Council have declared an AQMA based on past failures to comply with the national air quality objective on particulates (PM10), resulting from the operations of the Port Talbot steelworks.

[12] https://laqm.defra.gov.uk/technical-guidance/

2.1.4 Scotland

Scottish Government has provided local authorities in Scotland with specific LAQM policy guidance (PG(S).(16)), whilst maintaining UK-wide technical guidance (LAQM.TG16) for the duties of LAQM.

Submission of an Annual Progress Report (APR) is required by end of June each year. Failure to submit is likely to lead to penalties and issue of directions under reserved powers of Section 85 of Part IV of the Environment Act 1995.

A new air quality standard related to $PM_{2.5}$ has been set in Regulations, whilst the standards for PM_{10} already adopted are more stringent that those elsewhere in the UK. Moreover, links have been strengthened between LAQM and the Cleaner Air for Scotland over-arching strategy on air quality improvements in Scotland. In contrast to Wales, more substantive detail is provided in policy guidance in Scotland on the requirements of the LAQM regime and the approach and expectation of the air quality action planning process, following declaration of an air quality management area (AQMA).

Consideration to emission sources leading to air quality problems and the links with existing strategies and management approaches are included and used to guide local authorities in Scotland through their action planning considerations. The policy guidance is explicit in consideration of its links with other policy areas such as climate change and noise, with a view in the case of noise of at least making local authorities aware of the noise maps and noise action plans that exist in accordance with the Environmental Noise Directive.

2.1.5 England (excluding London)

The revised LAQM regime in England came into effect in April 2016 and requires that English authorities submit an Annual Status Report[13] (ASR) on air quality by the end of June each year. An option to fast track to the declaration of an AQMA exists for authorities in England where sufficient evidence exists.

As in Wales, an expectation to review action plans every five years is set and there is further expectation that contributions to achieving reductions in $PM_{2.5}$ should be reported – although, unlike in Scotland, no statutory obligation to appraise against $PM_{2.5}$ standards is set down.

[13] https://laqm.defra.gov.uk/review-and-assessment/report-templates.html

A strengthening of the links with the Public Health Outcomes Framework, e.g. the establishment of a direct link between $PM_{2.5}$ and health[14], requires that English authorities now work more closely with their Directors of Public Health on air pollution. Similar to the policy guidance in Scotland the policy guidance in England provides for a detailed consideration of the sources of air pollution in order to guide and aid the implementation of action plan measures to reduce emissions.

Consideration to links with other key policy areas is not an explicit requirement in policy guidance issued to English authorities, although links are implied such that noise is considered as a potential wider issue on some specific measures such as speed restrictions.

2.1.6 Northern Ireland

Policy guidance provided to local authorities in Northern Ireland has yet to have a significant update in the way that other policy guidance has elsewhere in the UK. The current policy guidance is dated 2010.

Currently the regime requires that authorities in Northern Ireland submit reports in accordance with the cycle of Updating and Screening Assessments (USAs) and Progress Reports, with Detailed Assessments as required under the regime that has been in place since the 2002 Environment Order came into effect. Whilst Further Assessments are still a formal requirement under Part III of the Environment (Northern Ireland) Order 2002, policy guidance recommends that Further Assessments not be submitted as separate documents but taken forward in parallel with the development of air quality action plans.

Currently, consultation on changes to the LAQM regime in Northern Ireland is yet to be undertaken, although it is widely anticipated that moves towards a single annual report submission on air quality will arise in order to streamline the reporting process, and be in line with other changes in the LAQM regime implemented elsewhere in the UK.

Links between local air quality and climate change, and links between air quality and wider environmental quality, including clear statements on noise, are recognised in the policy guidance such that local authorities in Northern Ireland are asked to have due regard to these aspects during their considerations to air quality action planning and implementation of air quality improvement measures.

[14] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/3/gid/1000043/pat/6/par/E12000008/ati/102/are/E06000036/iid/30101/age/230/sex/4

2.1.7 London

The LAQM regime in London has been streamlined more than most in recent years, with focus on London Boroughs being on air quality improvement measures rather than continued identification of non-compliant areas. This is primarily due to the large amount of existing assessment and analysis of air quality levels across London, done through a standard monitoring and modelling approach undertaken by Kings' College ERG.

London Boroughs are required to follow the London Local Air Quality Management (LLAQM) framework[15] under which the boroughs must prepare a specific London ASR. The LLAQM reflects the specific air quality challenges in the capital. Moreover, eligibility for Cleaner Air Borough status (which allows priority access to the Mayor's Air Quality Fund) is dependent upon successfully complying with a number of criteria under themes of political leadership - taking action on air quality; leading by example in implementing measures to improve air quality; information to the public; the use of the planning system to safeguard or improve air quality, and integration of air quality into public health.

The LLAQM regime integrates much of Transport for London's modelling work, which includes the mapping of NO_2 and PM concentrations across the GLA, to reduce the need for London Boroughs to carry out their own detailed dispersion modelling work. The LLAQM regime also introduces Air Quality Focus Areas, designed to be much smaller than the AQMAs, to allow London Boroughs to focus on these hot spots as a priority.

In October 2019, following a consultation exercise earlier in the year, the GLA updated the LLAQM framework. The 2019 LLAQM Borough Air Quality Action Matrix[16] provides a single example of a scheme which tackled air quality and noise. The 2019 LLAQM Technical Guidance (LLAQM.TG (19))[17] highlights the requirement to consult noise action plans (amongst other policies) when developing air quality action plans.

2.2 END NOISE ACTION PLANNING

2.2.1 Evolution after 2001 – Adoption of the END

The EU Green Paper on Future Noise Policy of 1996[18] recognised that environmental noise caused by traffic, industry and recreation is one of the

[15] https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/working-london-boroughs
[16] https://www.london.gov.uk/sites/default/files/2019_air_quality_action_matrix.pdf
[17] https://www.london.gov.uk/sites/default/files/llaqm_technical_guidance_2019.pdf
[18] "The Green Paper on Future Noise Policy" (COM(96) 540). European Commission. November 1996. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:51996DC0540&from=PT (accessed Jan 2019)

main local environmental problems in Europe and became the precursor to the Environmental Noise Directive (END).

At the time of the 2001 Report the END was under development and in draft, the main components and requirements of the END were therefore known at that time and provided a framework for the project in 2001. The END was subsequently adopted in 2002[19].

The focus of the END is to:

1. create strategic noise maps;
2. generate noise action plans; and
3. make information [on noise and action planning] available to the public.

The END requires Member States to produce strategic noise maps, to report the results (including population exposure to noise) to the European Commission and to prepare noise action plans based upon the maps, to avoid, prevent or reduce the harmful effects, including annoyance, due to exposure to environmental noise. Strategic noise maps produced under the END are required to be generated and reported to the Commission on a five-yearly cycle (December 2007, 2012, 2017, etc,...) with noise action plans reported also on a five yearly cycle, just over 1 year after the maps (January 2009, 2014, 2019, etc,…).

2.2.2 Transposition of the END (2001 to 2006)

Following the adoption of the Environmental Noise Directive, the UK embarked upon transposing the provisions necessary to implement the END into UK law.

The transposition took place between 2001 and 2006, during which time the policy became a devolved matter, subsequently requiring four individual sets of regulations.

The early stages of transposition resulted in a core document generated centrally by DETR (at the time). This document was then used as the basis of the transposition across the UK, although as devolution developed, the single core draft evolved and was adapted separately to meet the requirements of England and the devolved administrations. The four sets of Environmental Noise Regulations are therefore based around a largely similar approach, albeit with some differing technical details and competencies to suit local

[19] European Commission (2002). Directive 2002/49/EC of the parliament and of the council of 25 June 2002 relating to the assessment and management of environmental noise. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0049 (accessed Jan 2019).

requirements. The END was ultimately transposed into separate Regulations across the UK in 2006[20][21][22][23].

The Directive requires that "*Member States shall designate...the competent authorities…for implementing the Directive*". By its very nature strategic noise mapping, noise action planning and noise management are activities that require interactions with a significant number of cross-cutting disciplines, data sources and stakeholders. Given this, there are a variety of options available for defining the implementation approach and organisational or management structure for noise mapping projects. The organisational approach used can have a significant impact on the type of project that ensues and therefore the type of maps and action plans that are created.

Across the UK a (predominantly) centralised approach has been followed, whereby responsibility for creating strategic noise maps and noise action plans has been placed upon central or devolved government (or their agencies). This contrasts with the more decentralised approach to the local air quality management regime in operation in the UK where the responsibility for action planning falls on the local authority. It is understood that this centralised implementation approach had two drivers.

The first driver was to counter issues that had arisen in the early stages of LAQM action planning. It was felt that the effectiveness of local authority action plans were somewhat limited particularly where the source in question was not a local authority managed asset (for example a Highways England road traffic source).

The second driver was in response to concerns relating to the technical challenges in implementing the noise maps required by the END through local authorities. The nature of the END maps required a high degree of consistency and technical coordination, which could be controlled more effectively through a centralised approach.

In the early 2000s, noise mapping on a large scale was a relatively new concept and the generation of noise maps at a national scale was rightly seen as an extremely demanding and complex activity. It can therefore be argued that the challenging task of mapping somewhat dominated the design of the transposition, arguably at the expense of the focus on the design of action planning. This technical approach was therefore largely designed to focus on

[20] The Environmental Noise (England) Regulations 2006 (as amended). http://www.legislation.gov.uk/uksi/2006/2238/contents/made (accessed Jan 2019).
[21] The Environmental Noise (Wales) Regulations 2006 (as amended). http://www.legislation.gov.uk/wsi/2006/2629/contents/made (accessed Jan 2019)
[22] The Environmental Noise (Scotland) Regulations 2006. (as amended). http://www.legislation.gov.uk/ssi/2006/465/contents/made (accessed Jan 2019).
[23] The Environmental Noise Regulations (Northern Ireland) 2006. (as amended). http://www.legislation.gov.uk/nisr/2006/387/contents/made (accessed Jan 2019).

END delivery, rather than harmonising or integrating with related policy areas such as air quality and LAQM. As a result, the outset of the noise mapping and action planning regime, as set out in regulations, did not have any recognition of, or alignment with, other regimes such as air quality be that in terms of potential commonalities in activities, outcomes, timescales, data inputs or outputs.

The approach to transposition enabled relatively efficient delivery of the END across the UK, but it contrasted noticeably with transposition approaches across other member states, where city administrations and transport asset owners were often responsible for the combined delivery of air quality and noise assessments.

2.2.3 Strategic Noise Mapping (2007, 2012 and 2017)

The approach to designing and building each round of maps has varied across the UK. The maps have also evolved between the three rounds. The first round of noise mapping covering large urban areas (agglomerations) and major airports, roads and railways was completed in 2007. It is important to note that the geography of the END and the regulations mean that the whole of the country is not assessed and different locations are assessed in different ways. For example, inside agglomerations a receptor focussed assessment is carried out whereby all transport noise sources and large-scale industry are incorporated, in contrast to locations outside agglomerations where only major transport sources are assessed.

Strategic noise maps were generated separately across the four administrations of the UK, where a single national project was undertaken in Wales, Scotland and Northern Ireland while multiple projects were completed in England in order to fulfil the mapping obligations. Given the differing approaches, projects and project implementation decisions adopted across the UK, strategic noise map results are not consistent and are not directly comparable. To a certain degree, the first round of strategic noise maps has been considered a pilot exercise due to it being the first iteration of a policy based around a relatively new technical discipline combined with the technical complexity and magnitude of the task, and the fact that the second round resulted in an increased area to be mapped.

The extent of mapping required increased significantly between the first and second round of the END. For example the threshold for agglomerations fell from 250,000 to 100,000 resulting in the number of agglomerations captured across the UK rising from 28 to 73. The criteria for identifying major roads decreased from 6 million vehicle passages per annum to 3 million, resulting in an almost three-fold increase in the length of major road to be assessed. The second round of strategic noise mapping was reported to the EC in 2012, following the same administrative pattern as round 1 with separate projects being undertaken in the four administrations of the UK.

The significant change in thresholds combined with the 5 year interval between maps and the rapid advances in data and technology has resulted in a tendency for each round of mapping to be treated to varying degrees as an individual or new exercise (“rip and replace”). This has created a significant challenge and has promoted the view that the exercise is a one-off implementation giving a time-stamped, retrospective map, rather than an ongoing and evolving representation of the noise environment.

The third round of strategic noise maps was completed in 2017. Arguably the third round was the first opportunity to attempt to introduce the concept of change into strategic noise maps, however experience demonstrates that introducing change retrospectively into a 5 year old one-off time-stamped noise map that was not designed to be updated can present a large number of technical challenges. In order to generate a fully consistent output the data sources and methods need to be fully reproduced, however invariably without an ongoing and planned data management approach, the licensing and data sources can change. For example UK governments have licensed different height products across all three rounds of the END, each product with a different production method, accuracy and therefore implication on their use for strategic noise maps. In a similar way to the previous rounds, again the approach to generating strategic noise maps in the third round has varied across the devolved administrations. Change has been reflected to differing degrees and in different ways, however in general it would be fair to say the results are more comparable to round 2 albeit not necessarily entirely consistent.

2.2.4 Noise Action Plans (2009, 2014 and 2019)

The Environmental Noise Directive seeks to manage the impact of environmental noise through requiring the preparation, adoption and implementation of noise action plans (based upon the results of strategic noise maps). The formal requirements for noise action plans, as set out by the END are relatively limited. Perhaps in line with the principles of subsidiarity, the majority of the scope and requirements of action planning are therefore to be determined locally by individual Member States.

It can be argued that the END (and regulations) focus action planning on two main concepts, firstly important areas (or noise hotspots) and secondly quiet areas (inside agglomerations). For example, as promulgated from the END, regulations across the UK all require that Action Plans should “apply in particular to the most important areas as established by the strategic noise maps”.

Following the completion of the first round of strategic noise mapping in 2007 the four administrations of the UK embarked upon the process of generating, consulting upon and adopting noise action plans to meet the requirements of the END and regulations. As could be expected, it can be argued that there

has been even greater variation in the drafting and implementation of noise action plans across the UK than can be observed in the approaches to strategic noise mapping.

Round 1 noise action plans were adopted across the UK at different times between 2009 and 2010. There is a relatively longstanding noise management and noise policy regime in operation across the UK. Given the pre-existence of this policy framework it can be argued that, similarly to the mapping process, the regulations and early stages of the implementation of action plans focussed upon compliance with the END and its transposing regulations. The potential strength of strategic noise maps and noise action plans has therefore been limited without the overt end-use requirement beyond compliance with the END.

Differing approaches have been adopted across the UK in order to identify 'important areas' and also to determine their context in terms of the implementation of action plans and also their wider role in the noise management process. For example, important areas in England, Wales, and Northern Ireland (referred to as Important Areas, Priority Areas and Noise Management Areas respectively) have been identified primarily based upon identifying the highest exposed locations. In contrast, locations in Scotland (referred to as Noise Management Areas) have been identified using a prioritisation matrix of sources and receptors, effectively giving weight to certain factors for example to higher populated buildings/areas.

The second round of noise action planning saw some further evolution in noise action plans across the UK, including for example a move away from the document structure alluded to by the END whereby in England in round 1 there were 25 individual noise action plans (excluding for airports), which were collapsed to three action plans in round 2, for major roads, major railways and (all) agglomerations.

In Wales, a single national noise action plan was generated thereby attempting to reflect a move towards a national approach rather than an approach based upon the requirements and potential inequalities inbuilt in the geography of the END.

The approach to identifying quiet areas (inside agglomerations) has also been addressed in different ways and to differing degrees. For example, the Welsh Government adopted an approach during the implementation of round 1 action planning in 2011 based around principles of soundscape and tranquillity, whereby nominations of candidate quiet areas were made by local authorities relevant to areas inside agglomerations. As a result 29 quiet areas were formally designated in 2012. Further nominations were received as part of the second round action planning process resulting in a total of 63 quiet areas being designated across the three agglomerations in Wales, later in 2012. It is commonly voiced that one of the limitations of the END and

Regulations in relation to quiet areas is the fact that urban quiet areas can only be identified inside agglomerations. As a result of this it was noted that there were a number of potentially relevant areas on the edge and immediately outside the agglomeration boundary that could not be identified. It is for this reason that the agglomeration boundaries were updated in Wales between round 1 and round 2 in order to incorporate some of these areas and allow them to be formally identified as urban quiet areas. The process of identifying candidate quiet areas in Scotland and Northern Ireland has at the initial stages been based more around the results of the strategic noise maps and three quiet areas were designated in Belfast agglomeration in 2016.

It can be argued that the centralised approach to the majority of the implementation of the END in the UK has been hugely successful at achieving compliance with the END; however it may have caused some challenges in engaging with stakeholders. These shortcomings are perhaps the opposite challenges to those that may have been observed in the more decentralised approach that can be found in air quality management. A number of approaches have been used to enable the interaction between the competent authority and the stakeholders, particularly local authorities.

Across the three rounds of the Directive, the development and subsequent implementation of action planning in Wales, Scotland and Northern Ireland have all benefited from the formation of a range of noise stakeholder or structured working groups formed in order to bring relevant stakeholders together with the national government (invariably the competent authority). In contrast, due to the differing magnitude of stakeholders (including 326 local authorities and over 150 local highways authorities) a more remote approach has been utilised in England.

A web based tool[24] was used for the first and second round to communicate with relevant stakeholders in England and allow them to provide input back to the competent authority. In order to facilitate this process the action plans defined stakeholders as either 'Noise Making Authorities' (including national, regional or local highways authorities and rail authorities) or 'Noise Receiving Authorities' (comprising 326 local authorities).

Noise action plans for the third round of the END were consulted upon during 2018 and final noise action plans have been adopted or are nearing adoption across the UK.

In Wales, the Noise and Soundscape Action Plan was adopted in December 2018. The third round of action planning in Wales has evolved in order to further embrace principles of soundscape and to more closely integrate noise policy with that of air quality. Noise policy and the action planning now also sit within the framework of the Well-being of Future Generations (Wales) Act

[24] Noise Action Planning Support Tool (no longer in operation).

2015 requiring an integrated approach not only with air quality but also other environmental disciplines. It is clear that the direction of policy is moving from isolated disciplines towards more integrated ways of working including a move towards more health based evidence bases and policies.

2.3 OPPORTUNITIES FOR FUTURE INTEGRATION OF AIR QUALITY AND NOISE POLICY

From the retrospective review of air quality and noise action planning since the time of the 2001 Report it can be seen that the two disciplines have been implemented and operated in relative isolation from one another. This separation has occurred at a policy and technical level for a number of reasons. The policy regimes under which air quality and noise action planning are undertaken were implemented several years apart from one another, with the latter implementation of END taking a different approach.

There are differences in competency, with local authorities leading on air quality action planning, but central government being responsible for the development of noise action plans.

The regimes operate under different implementation timescales. Progress with implementation of air quality measures is considered on an annual basis (with a 5-year anticipated lifetime of an action plan), whereas noise action planning measures tend to be looked at on a 5-yearly cycle. While it is acknowledged that both regimes require consideration of co-benefit, this operational difference is likely to be a significant inhibitor to developing genuinely integrated solutions, with equal consideration being given to both pollutants.

Despite air quality and noise assessments often being commissioned separately from one another under separate policy drivers, they often consider the same pollution sources and receptors; and make use of the same underlying digital information. This can be seen in the similarity of the air quality and noise maps for Cardiff, as set out in Figures 1 and 2, below.

It is recognised that there is an emerging appetite for greater policy integration. The refocussing of environmental protection around the public health agenda has paved the way for policies such as the Well-being of Future Generations (Wales) Act 2015 in Wales. This in turn is providing a policy framework in which joined up action planning can be delivered.

Notwithstanding the decision to exit the EU, the technical aspects of Directive 2015/996 which implement the Common Noise Assessment Methods for Europe (CNOSSOS-EU), provide a potential basis for future noise mapping approaches to align with air quality modelling.

At a time when rapid changes are taking place in technology such as electric vehicles, advances in data and information systems and there are significant policy movements in related disciplines, such as the declaration of a climate emergency, there is both a need and a renewed opportunity to integrate air quality and noise action planning for the future.

Figure 1. Defra PCM Modelling NO_2 Forecast Results 2021[25]

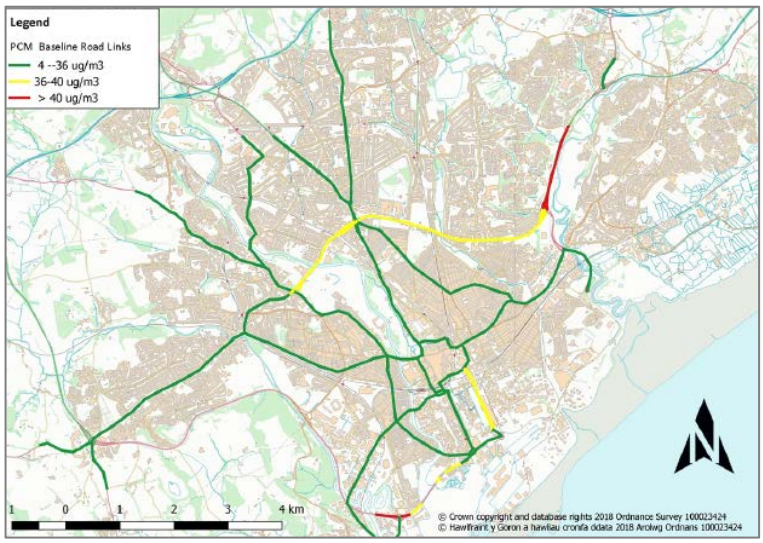
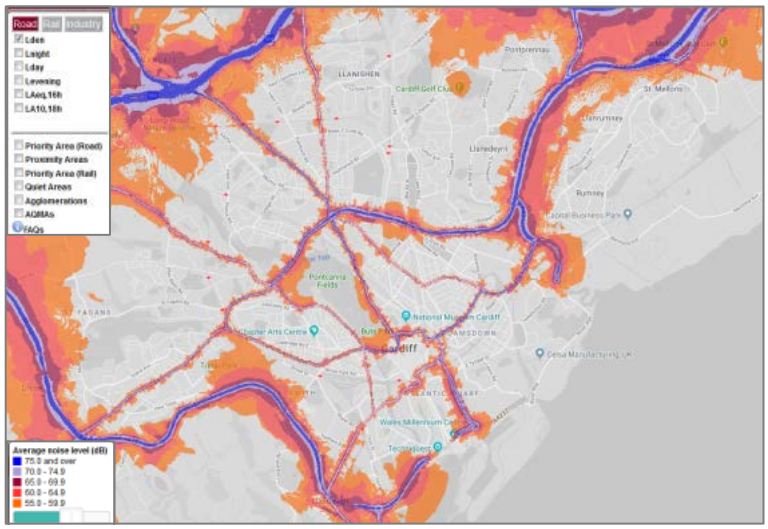


Figure 2. Round 3 Strategic Noise Mapping, L_{den} Roads 2017[26]



25 https://cardiff.moderngov.co.uk/documents/s28260/Cabinet%2021%20March%202019%20Clean%20Air%20report.pdf?LLL=0

26 http://extrium.co.uk/walesnoiseviewer.html

3 ACTION PLAN MEASURES CLASSIFICATION

In order to be able to assess to what extent measures set out in air quality and noise action plans might be able to benefit from synergy or create conflict, it is necessary to develop a classified list of potential measures which might be considered by action planners.

The 2001 Report sets out a schedule of measures for roads, rail and industrial air quality and noise action planning. It is likely that in the passing of time, a wider range of possible action planning measures have been identified by practitioners. Additionally, with the need to undertake systematic reporting and communication of measures under various reporting obligations and their logging in electronic database systems, it is likely that a formalised schedule of measures may now exist.

A review of relevant air quality action planning guidance has been undertaken to assess whether a measures list exists and whether it can be used as a basis for further comparison within this report. The review prioritised air quality on the basis that air quality action planning tends to be more advanced and is therefore more likely to present a classification scheme which can be used as a foundation for the current project. A similar approach was adopted for the 2001 Report.

3.1 IDENTIFICATION OF A CLASSIFIED AQAP MEASURES LIST

Evolution of the measures considered for improving air quality through action plans has grown through closer alignment of the control of road traffic emissions through traffic management and transport planning. This has placed emphasis on achievement of modal shift through local authority transport planning, encouraging the use of more sustainable forms of transport including walking and cycling and ensuring that urban planning addresses connectivity issues that lead to less of a reliance on conventional petrol and diesel vehicle usage.

Moreover, the Office for Low Emission Vehicles[27] (OLEV) – a joint working venture between the UK Government Departments of Transport and Business, Energy and Industrial Strategy – has been taking the lead on ensuring the UK is an early global adopter of low emission vehicles.

Proposals made by the UK Government in the Road to Zero Strategy[28] on the phasing out of petrol and diesel vehicles by 2040 represents a wholesale change in the way in which transport methods will be operated in the future.

[27] https://www.gov.uk/government/organisations/office-for-low-emission-vehicles
[28] https://www.gov.uk/government/news/government-launches-road-to-zero-strategy-to-lead-the-world-in-zero-emission-vehicle-technology

Notwithstanding these developments, the need to achieve a consistent approach in the reporting of measures adopted by local authorities in their local air quality action plans has become evident in the last 5 years as central Government has faced pressures to comply with EU limit values.

In order to show the net contribution of local authority endeavours to improve local air quality – and therefore make a contribution to the compliance with EU limit values – a standard annual reporting template[29] is now provided separately for each of the local authorities in England, Wales, Scotland and Northern Ireland, respectively. This is to be used by local authorities whether they are formulating action plans for the first time, or whether they are revising or updating an existing action plan.

The move to a consistent codification of action plan measures through the air quality regime provides for a more prescribed method of reporting but does not represent any change in overall direction of flexibility and freedom for local authorities to adopt measures for reducing pollution that they see as wholly applicable within their areas under the LAQM regime (taking account of the more prescribed adoption of Clean Air Zones for national compliance purposes within the current adopted national plan for roadside NO_2 against the EU limit values).

Each of the annual reporting templates contains a classified schedule of measures structured around a 2-tier classification scheme of "EU Category" and "EU Classification". This classification scheme has been issued by the EU to structure Member State reporting of air quality measures. The 'EU' classification scheme is set out in Appendix I.

LAQM.TG(16) also sets out a classified schedule of action plan mitigation measures in Annex A: LAQM Toolbox, Table A1 – Action Toolbox. From a review of the measures classification schemes set out in LAQM.TG(16) and the annual reporting templates, it can be seen that they are broadly the same except for 2 distinct differences.

The EU measures list includes 8 measures classes which are not included in in LAQM.TG(16). These are:

- Introduction/increase in environmental funding through permit systems and economic instruments;
- Other measures through permit systems and economic instruments;
- Other policy (policy guidance and development control);

[29] https://laqm.defra.gov.uk/review-and-assessment/report-templates.html

- Other (measures than those listed, relating to the promotion of low emission plant);
- Intensive active travel campaign and infrastructure;
- Emission based parking permit charges;
- Strategic highway improvements, re-prioritising road space away from cars, including access management, selective vehicle priority, bus priority, high vehicle occupancy lane, and
- Workplace parking levy, parking enforcement on highway.

There is also a noticeable inclusion of an additional category relating to 'Improving air quality modelling and assessment' set out in LAQM.TG(16) which does not appear in the EU list.

Given the similarities and use of both LAQM.TG(16) and the annual reports in current air quality action planning under LAQM, it seems sensible to consolidate the two classification lists into a single classification scheme and to use this as the basis for the updated evaluation of air quality and noise mitigation synergies and conflicts.

In addition to the consolidated list, there is a possibility that previously reported mitigation measures in the 2001 Report are not covered by the scope of the current consolidated classification scheme. There is also a possibility that the Consultants identify other new measures which reflect latest best practice. In such cases these measures will be further included.

The final schedule of all measures is set out in Appendix II.

3.2 EVALUATION OF 2001 REPORT MEASURES CATEGORIES

The 2001 Report considered measures from a knowledge and understanding of adopting measures according to the following over-arching themes:

- Activity planning
- Land use planning
- Transmission controls
- Source controls

The language is typical of an 'engineering approach' with understanding of planning and transport management, although is typically not necessarily reflective of terminology used by local authorities in their consideration to measures adopted for air quality in their action plans.

In contrast, both the EU categories adopted under LAQM and those set out in Annex A of LAQM.TG(16) better represent the approaches to measures that wider stakeholders and the public will understand. They are:

- Alternatives to Private Vehicle Use
- Environmental Permits
- Freight and Delivery Management
- Policy Guidance and Development Control
- Promoting Low Emission Plant
- Promoting Low Emission Transport
- Promoting Travel Alternatives
- Public Information
- Traffic Management
- Transport Planning and Infrastructure
- Vehicle Fleet Efficiency
- Improving AQ Modelling and Assessment
- Other

Whilst one can argue around the applicability of the language, the identification of measures that sit within each category and the qualitative evaluation of whether their impacts on air quality or noise are positive or negative they are, by and large, still relevant.

3.3 EVALUATION OF 2001 REPORT MEASURES

In reviewing the measures set out in the 2001 Report for road, rail and industry against the currently proposed measures schedule, it can be seen that the measures set out in the 2001 Report did not contain any measures which would be classified under the following contemporary categories:

- Environmental Permits
- Policy Guidance and Development Control
- Promoting Low Emission Plant

- Public Information

This highlights that the original 2001 Report's focus was on transport and traffic management, or engineering solutions.

Whilst some measures were considered in respect of "alternatives to private vehicles" indicating that behavioural change formed part of the initial consideration in synergies and conflicts between air quality and noise the air quality regime has arguably adapted to enhance public understanding of air quality.

As highlighted in previous earlier considerations to the evolution of the LAQM regime, public understanding and perception of air pollution have been greatly enhanced, in part, by engagement with Directors of Public Health.

Consideration to non-transport measures, and specifically those that could be applied through environmental permits of industrial installations, or through development control measures, is also an evident difference between comparisons between contemporary classifications of air quality measures and those included in the original 2001 Report.

It is also evident through comparison with the evolution of air quality action planning that measures to reduce emissions from mobile plant – through application of conditions on contractors to utilise low emission plant – show a greater reach of consideration to controls than in the 2001 Report.

4 COMPARISON OF AQ AND NOISE MEASURES

Using the new measures classification scheme (see Appendix II), consideration has been given as to whether each measure has the potential to work in synergy – to deliver a co-benefit to both air quality and noise - or whether there is likely to be a conflict.

From experiences gained in implementing and reviewing action plans for both air quality and noise, it is accepted that the true determination as to whether combined benefits can be achieved, or whether conflicts might occur and to what extent, is ultimately a site specific consideration. With this in mind it is therefore down to those implementing the measures across both air quality and noise to ensure that a win-win outcome is largely achieved. However to provide as useful a guide as possible, the following sections highlight whether individual measures have the potential to deliver a synergistic benefit; therefore enabling measures to be identified for further detailed consideration at a scheme level.

It is also recognised that action planning is likely to utilise a combination of measures in conjunction with one another. Typically a suite of measures comprising behaviour change, policy making and technical solutions are likely to be present in modern air quality and noise action planning.

The following tables set out a description of each of the measures by Measure Category. Mirroring the approach taken in the 2001 Report, for each measure an assessment has been made as to whether there is likely to be a positive, neutral or negative effect for air quality and noise respectively.

In a departure from the 2001 Report, the Consultants have not included a 'scheme specific' category as it is felt that the effectiveness of all measures is ultimately scheme specific. Instead, identification has been made where it is felt that there is a risk that a potentially positive outcome could result in a negative outcome if the measure is not planned or designed properly. Such measures are highlighted with 'R' in the tables.

Finally, in each table commentary is provided explaining the rationale for the evolution outcome alongside any specific considerations.

4.1 REVIEW OF UPDATED MEASURES

4.1.1 Traffic Management

Table 2. Traffic Management Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Urban Traffic Control (UTC), congestion management, traffic reduction	√			R	√			R	Measures that have potential to deliver co-benefit include ramp metering and road closures/restrictions. Measures should evaluate both AQ and noise impacts as there is a potential for conflict in certain situations, e.g. traffic displacement.
Reduction of speed limits, 20mph zones	√					√			Imperial College carried out research published in 2013 - An evaluation of the estimated impacts on vehicle emissions of a 20mph speed restriction in central London[30]. It concluded that the effects of a 20mph speed restriction were shown to be mixed, with particular benefit seen for emissions of particulate matter and for diesel vehicles. It also concluded that air quality is unlikely to be made worse as a result of 20mph speed limits on streets in London. This analysis is suitable for per-vehicle emission rates, but did not consider secondary effects such as congestion. May be wider safety benefits.

[30] https://www.cityoflondon.gov.uk/business/environmental-health/environmental-protection/air-quality/Documents/speed-restriction-air-quality-report-2013-for-web.pdf

Road User Charging (RUC)/ Congestion charging	√			R	√			R	Can lead to reduction in emissions of air pollution and traffic volumes, but this may not always lead to an improvement in AQ or significant reductions in noise - potential for confounding effects - needs detailed assessment.
Anti-idling enforcement	√			R	√				Likely to lead to co-benefit through engine cut out while vehicles are stationary, although a small risk that tonal changes in noise may pose localised risk of complaint. As increasing numbers of vehicles include this technology, authorities may wish to consider how management of traffic controls might affect local noise complaints. This measure may be particularly relevant close to schools.
Testing vehicle emissions (for AQ and noise)	√				√				Roadside emission testing may be used by local authorities in England and Wales which have declared a traffic-related air quality management area (AQMA) under s.83 of the Environment Act 1995. Powers also exist to enable authorities to control noisy exhausts.
Emission based parking or permit charges	√				√				Can be designed to benefit both noise and AQ through reducing use of private vehicles or through combining AQ and noise reduction policies into parking policies.
Workplace parking levy, parking enforcement on highway	√				√				Potential for co-benefit.
Strategic highway improvements, re-prioritising road space away from cars, including access management, selective vehicle priority, bus priority, high vehicle occupancy lane	√			R	√			R	Has potential to deliver co-benefit - very scheme specific (bus priority and high occupancy vehicle lanes). Benefits may also relate to vehicle type and service levels.
Pedestrianisation	√			R	√			R	Potential for co-benefit, but there is a risk for conflict and impact on health e.g. through displacement of traffic.
Road tables			√				√		Generally considered to be negative - but effects are scheme specific and may provide localised benefit through reduced traffic speeds and volumes. Recognise they may deliver safety benefits.

Speed increase from 30 to 40-50 mph			√		√			R	Speed emission curves show that in general a further marginal reduction in emissions of pollutants can be achieved with an increase in speed in this range. Where this may not be the case is where a road link is on a gradient.

4.1.2 Promoting Travel Alternatives

Table 3. Promoting Travel Alternatives Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Workplace travel planning	√				√				Potential for co-benefit through schemes such as green commuter plans, car sharing, or specific work schemes. Can also work with behaviour change approaches.
Encourage / facilitate home-working	√				√				Potential to deliver co-benefit through reducing use of private vehicles and reduces load on public transport network.
Personalised travel planning	√				√				Potential to deliver co-benefit through reducing use of private vehicles and reduces load on public transport network.
School travel plans	√				√				Potential to deliver co-benefit through reducing use of private vehicles, especially at rush hour times. Schemes need to be designed holistically, e.g. providing public transport alternatives, or through parent lift share schemes.
Promotion of cycling	√				√				Potential to deliver co-benefit through reducing use of private vehicles. Health benefits to cyclists maximised if cycle routes take them away from busy sources of pollution. Consideration should also be given to safety and infrastructure design to accommodate/facilitate cycling, especially for school children.
Promotion of walking	√				√				Potential to deliver co-benefit through reduction of private vehicles. Health benefits to pedestrians maximised if paths take them away from busy sources of pollution.

Promote use of rail and inland waterways	√			R	√			R	Potential to deliver co-benefit through reduction of private vehicles in relation to overall journeys, however there may be local risks, e.g. where commuters drive to a local station, contributing to traffic volumes and congestion; potentially increasing localised air pollution and noise levels in vicinity of station. May be a particular risk during rush hour periods. Scheme planning should consider wider risks.
Intensive active travel campaign and infrastructure	√				√				Potential to deliver co-benefit. Health benefits maximised if routes take users away from sources of pollution. Sustained long term benefits should be considered.

4.1.3 Public Information

Table 4. Public Information Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Via leaflets	√				√				Potential to encourage behavioural change by designing messages to promote reductions in both pollutants. Could also dovetail with other practical measures.
Via the Internet	√				√				Potential to encourage behavioural change by designing messages to promote reductions in both pollutants. Could also dovetail with other practical measures. May be useful means of providing more detailed information and access to discussion forums.
Via radio	√				√				Potential to encourage behavioural change by designing messages to promote reductions in both pollutants. Could also dovetail with other practical measures.
Via television	√				√				Potential to encourage behavioural change by designing messages to promote reductions in both pollutants. Could also dovetail with other practical measures.
Via other mechanisms	√				√				Could include 'smart' information based solutions, e.g. intelligent routing systems delivered via smart phones or satnav systems. Could include education programmes in schools and displays in prominent public places. Potential to drive behavioural change by designing systems to consider both pollutants.

4.1.4 Transport Planning and Infrastructure

Table 5. Transport Planning and Infrastructure Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Public transport improvements – interchanges, stations and services	√				√				Has potential to deliver co-benefit on the assumption it encourages modal shift away from private vehicle use and onto public transport. Combine with low emission public vehicles, etc.
Public cycle hire scheme	√				√				Potential to deliver co-benefit if it results in modal shift away from private cars and reduces demand on private transport infrastructure.
Cycle network	√			R	√			R	Potential to deliver co-benefit if it results in modal shift away from private cars and reduces demand on private transport infrastructure. Health benefits to cyclists maximised if cycle routes take them away from sources of pollution. There is a risk displacement of other traffic increases air pollution and noise levels elsewhere. Benefits and risks are very scheme specific and require holistic consideration during scheme planning.
Bus route improvements	√				√				Has the potential for co-benefit; however level of benefit is typically scheme specific and will vary.
Road tunnels	√				√				Has the potential to deliver co-benefit at specific location adjacent to the tunnel; however consideration should be given to the potential effects of exhaust gases being released via ventilation shafts/vents, and increased pollution for road users.

Metros or light transit system	√			R	√			R	Potential for benefit if modal shift occurs, however there is a risk of traffic displacement and of increased noise from wheel squeal. Consideration should be given to use of other complementary measures to ensure benefits are 'locked in', e.g. through discouraging new road users seeking to gain from reduced traffic levels and congestion.
Roadside and railside noise/environmental barriers	√				√			R	Has the potential to deliver noise and AQ benefit. AQ benefit is very scheme specific and depends on design considerations such as orientation to prevailing wind direction.
Mounding	√				√			R	Has the potential to deliver noise and AQ benefit. AQ benefit is very scheme specific and depends on design considerations such as orientation to prevailing wind direction.
Quiet surfacing	√					√			Likely to deliver noise benefits, but unlikely to lead to significant change in air quality levels.
Train skirts	√					√			Likely to deliver noise benefits, but unlikely to lead to significant changes in air quality levels.

4.1.5 Alternatives to Private Vehicle Use

Table 6. Alternatives to Private Vehicle Use Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Bus based park and ride	√			R	√			R	Risk of immediate impacts on receptors in close proximity to proposed park and ride sites. Further positive enhancements gained through use of electric buses.
Car & lift sharing schemes	√				√				Additional gains to be made from promoting use of low emission vehicles.
Car clubs	√				√				Additional gains to be made from use of low emission vehicles.
Rail based park and ride	√			R	√				Risk of immediate impacts on receptors in close proximity to proposed park and ride sites.

4.1.6 Policy Guidance and Development Control

Table 7. Policy Guidance and Development Control Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Regional groups co-ordinating programmes to develop area wide strategies to reduce emissions and improve air quality	√				√				It is assumed coordinated programmes would deliver AQ benefits. The benefits to noise would need to be considered on a scheme specific basis; however due to the strong potential for individual measures/schemes to deliver co-benefit, it is likely that benefits in noise level will also be delivered. It is recommended that reduction in noise be considered as a (combined) strategic objective.
Air quality planning and policy guidance	√				√				Assume positive for both pollutants on basis current AQ planning and policy guidance recommends consideration of wider environmental impacts on e.g. noise.
Sustainable procurement guidance	√				√				It is recommended that AQ and noise co-benefits be considered as part of a sustainable procurement strategy. It is Welsh policy for sustainable development to be a consideration in procurement[31].
Low Emissions Strategy	√				√				Likely to deliver noise benefit by introduction of electric vehicles and Euro 6 standards.
Stricter development controls	√				√				Potential for co-benefit.
"Buffer" zones	√				√				Potential for co-benefit around industrial sites and schools.

[31] https://prp.gov.wales/planners/general/strategy/procstrat/sustainabledevelopment/?lang=en

Heavy/light industry zones	√				√			R	Potential for co-benefit. It is assumed that any industry zoning would also enable noise and AQ to be considered together, therefore leading to improvements in both. There is a risk that zoning may lead to concentration in air pollutant emissions.
Relocation	√				√				Potential for co-benefit.
Property insulation grant scheme	√					√			There is a potential benefit for noise; however this is less likely to be beneficial in terms of reduced air pollution exposure, due to the complexities and site specific nature of building ventilation. There are potential co-benefits from other architectural solutions, such as winter gardens and active filtration systems. Very scheme specific.
Local bypasses	√				√				Likely to deliver reductions in localised air pollution and noise, however there may be implications for overall increases in emissions of air pollution and greenhouse gases (GHG).
Siting new roads away from properties	√				√				Likely to deliver reductions in localised air pollution and noise, however there may be implications for overall increases in emissions of air pollution and greenhouse gases (GHG). It may also be worth considering siting new properties away from roads.
Building layout/orientation	√			R	√			R	Potential for co-benefit, but significant risk if not designed/considered properly. Potential to obtain additional benefits in energy reduction.
Vegetative screens	√				√				Has potential for co-benefit, but very site specific. AQ benefits attributed to physical presence (effect on dispersion) rather than uptake of pollutants by photosynthetic processes. For further information, see recent guidance from the Mayor of London[32] and AQEG[33]. Noise benefits likely to be perceptual (the sight of vegetation makes a place 'feel' quieter) and through the addition of natural masking sounds (wind in trees, birdsong) rather than reduction in decibels.. Important to design roadside vegetation so that it both reduces public exposure to air pollution and attracts soundscape-enhancing native wildlife such as songbirds. Relevant to soundscape assessments.

[32] https://www.london.gov.uk/sites/default/files/green_infrastruture_air_pollution_may_19.pdf
[33] https://uk-air.defra.gov.uk/library/reports.php?report_id=966

4.1.7 Freight and Delivery Management

Table 8. Freight and Delivery Management Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Freight consolidation centre	√			R	√				Potential benefits for AQ and noise, but schemes need to be co-designed for AQ and noise benefit, to avoid potential noise issues.
Route management plans / strategic routing strategy for HGVs	√				√				Potential for co-benefit if designed with both AQ and noise in consideration. Consider alternative vehicle options.
Quiet & out of hours delivery	√			R	√				Potential for co-benefit if designed with both AQ and noise in consideration; however out of hours delivery likely to be a serious risk of increased noise issues, especially close to residential areas.
Delivery and service plans	√			R	√				Potential for co-benefit if designed with both AQ and noise in consideration. There is a risk of noise impacts, e.g. night time deliveries, roll shutters, etc, if not designed for AQ and noise benefit.
Freight partnerships for city centre deliveries	√				√				Potential co-benefits. Consideration should be given to combining with lower emission vehicles to achieve enhanced benefit.
Transfer of freight to rail	√			R	√				Potential for regional AQ and noise benefits, but there is a risk of localised impacts, especially for noise. Schemes need careful planning. Consideration could be given to combining with specific planning conditions, e.g. facilities can only be serviced with Euro 6 class HGVs. Consider water transport.

4.1.8 Vehicle Fleet Efficiency

Table 9. Vehicle Fleet Efficiency Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Driver training and ECO driving aids	√				√				Potential for co-benefit. Potential to combine with public information.
Promoting low emission public transport	√				√				Potential for co-benefit. Should be combined with sustainable procurement strategies to benefit from the use of alternative fuels and improved vehicle technologies.
Vehicle retrofitting programmes	√				√				Potential for noise benefits with certain retrofit technologies. Operators should consider noise impacts of retrofit options. This measure should be combined with sustainable procurement policies. Consider against replacement costs.
Fleet efficiency and recognition schemes	√				√				Potential for co-benefit. Should be considered alongside sustainable procurement policies.
Testing vehicle emissions	√				√				Roadside emission testing may be used by local authorities in England and Wales which have declared a traffic-related air quality management area (AQMA) under s.83 of the Environment Act 1995. Powers also exist to enable authorities to control noisy exhausts.

4.1.9 Promoting Low Emission Transport

Table 10. Promoting Low Emission Transport Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Low Emission Zone (LEZ) / Clean Air Zone (CAZ)	√				√				Potential for co-benefit, through a combination of overall reduction in private vehicles and/or relative increase in electric vehicles.
Public vehicle procurement – prioritising uptake of low emission vehicles	√				√				Potential for co-benefit. It is Welsh policy for sustainable development to be a consideration in procurement. Further information is available at the Welsh Government's Procurement Route Planner site[34].
Company vehicle procurement – prioritising uptake of low emission vehicles	√				√				Potential for co-benefit, in particular with electric vehicles. Applies to road and rail transport sources.
Procuring alternative refueling infrastructure to promote low emission vehicles, EV recharging, gas fuel recharging	√				√				A significant dependency to enable the increased uptake of low emission and electric vehicles. This is considered a significant opportunity/need. Consideration should be given to the use of Section 106 agreements. Further information is available, for example, in Welsh Assembly Briefing[35].
Priority parking for LEVs	√				√				Potential for co-benefit.
Taxi licensing conditions	√				√				Potential for co-benefit through conditions enforcing use of electric and low emission vehicles, or through tighter enforcement measures.
Taxi emission incentives	√				√				Potential for co-benefit by incentivising electric / low emission vehicles.

[34] https://prp.gov.wales/planners/general/strategy/procstrat/sustainabledevelopment/?lang=en
[35] http://www.assembly.wales/Research%20Documents/19-024/24%20-%20Web%20-%20English.pdf

4.1.10 Promoting Low Emission Plant

Table 11. Promoting Low Emission Plant Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Public procurement of stationary combustion sources	√				√				Potential for co-benefit, especially when undertaking a new procurement exercise in which alternative lower emission options can be considered. Likely to involve tighter emissions standards on plant which also enables lower noise emissions to be considered, or a change in energy generation (off site) which can lead to removal or relocation of local plant, therefore leading to localised reduction in noise and air pollution.
Low emission fuels for stationary and mobile sources in public procurement	√				√				Potential for co-benefit on the assumption that new plant utilising low emission fuels is likely to be quieter. This measure should be combined with sustainable procurement strategies.
Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources	√				√				Potential for co-benefit on the assumption that new low emission plant can also be quieter. This measure should be combined with sustainable procurement strategies.
Other measures for low emission fuels for stationary and mobile sources	√				√				Potential for co-benefit where moving to low emission fuels, e.g. low sulphur, LPG, electric, etc., especially if incorporating noise reduction at the same time. Combine with measures relating to sustainable procurement.

Regulations for fuel quality for low emission fuels for stationary and mobile sources		√			√				Where existing plant utilises low emission fuel there is likely to be an air pollution reduction; however acoustic performance is is not likely to change significantly.
Shift to installations using low emission fuels for stationary and mobile sources	√				√				Potential for co-benefit on the basis that a new procurement decision would provide an opportunity for opportunity for joint noise and AQ improvement.

4.1.11 Environmental Permits

Table 12. Environmental Permits Measures

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Introduction/increase of environment charges through permit systems and economic instruments		√			√				Potential for AQ improvement although unlikely to lead to significant noise improvement.
Large combustion plant permits and national plans going beyond BAT	√			R	√				Going beyond BAT has the potential to deliver co-benefit especially if this involves further technological investment, which therefore has a potential to also improve the noise profile. This is likely to be site and technology specific.
Measures to reduce pollution through IPPC permits going beyond BAT	√			R	√				Going beyond BAT has the potential to deliver co-benefit especially if this involves further technological investment, which therefore has a potential to also improve the noise profile. This is likely to be site and technology specific.
Tradable permit system through permit systems and economic instruments	√			R	√				Emissions trading could lead to decreases in noise; however there is a risk associated with technology such as scrubbers having the potential to increase noise. (This relates to measures that go beyond BAT, above).
Type approval/CE tests on wood burning stoves		√			√				Unlikely to lead to significant improvements in noise.
Use of "self-screening" factory buildings	√				√			R	Has the potential for co-benefit, but significant risk if not designed/considered properly. Relationship with spatial planning.

4.1.12 Improving AQ (and Noise) Modelling and Assessment

Table 13. Improving AQ (and Noise) Modelling and Assessment

Combined Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise Risk	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Risk	Evaluation/Consideration
Improving modelling predictions	√				√				Although this measure is primarily focused on improving the modelling of NO_2 concentrations, increased levels of detail may also be relevant for modelling noise assessments, in particular the use of detailed activity data, e.g. detailed classified train and road vehicle data. There are potential cost savings and efficiencies which could be achieved by coordinating data supply and combined modelling assessments. Could also support development of strategies, scenario testing, KPIs.
Tools to assess traffic management schemes prior to implementation	√				√				There is a potential to develop combined assessment tools which consider both air quality and noise outcomes. This is particularly relevant if considering the economic and/or health effects of decisions.
Tools to evaluate measures to reduce traffic emissions	√				√				There is a potential to develop emission assessment tools which could support further air quality concentration and noise modelling (mapping) assessments. This has significant potential to deliver efficiency savings if designed appropriately and is particularly relevant if co-assessments are planned.
Investigating specific measures and issues to understand their air quality impact	√				√				It is possible to consider noise impacts alongside those of air quality. Allows strategies to be more thought out and planned prior to implementation to optimize outcomes adjusting for all confounders.

5 COMBINED ACTION PLANNING

This report has identified the potential for a closer alignment in air quality and noise action planning and identified that the significant majority of mitigation measures have the potential to deliver a combined benefit.

Examples are provided below of wider policy areas where consideration is ongoing with respect to the potential alignment of action planning.

Examples of research, specifically exploring issues around combined action planning, are set out and finally a series of best practice examples are provided.

Whilst there has been discussion on more closely aligning noise and air quality assessments, policies and actions for more than 18 years, finding practical examples of an integrated approach to multi-exposure assessment and interventions has proven challenging. Set out below are a few examples of the approaches which have been identified

5.1 POLICY LEVEL DEVELOPMENTS

5.1.1 Review of Directives

In December 2016 DG Environment published the findings and conclusions from the second implementation review and evaluation of END carried out under the EC's Regulatory Fitness and Performance (REFIT) programme.

During the review a number of public authorities interviewed maintained that the Directive's relevance could be strengthened if a holistic approach were to be adopted with regard to noise management, including an integrated approach that combines noise and other environmental issues, notably air quality. The scope for potential synergies between noise action plans under the END and air quality plans under the Air Quality Directives was also raised. The review concluded that there may be scope for greater synergies (and ensuring greater consistency) between NAPs produced under the END and air quality plans prepared through the Air Quality Directives which could potentially reduce costs or at the least, allow potential cost synergies to be further explored and if some are identified, exploited. However, the subsequent report to the Parliament in March 2017 did not mention this as an action.

The Commission finalised its Fitness Check on Reporting and Monitoring of EU Environment Policy in June 2017, however this did not recommend an alignment of the reporting timetables for the Environmental Noise and Air Quality Directives, as had been discussed in the review of the END, and it would appear that the only change in timetable on the horizon will be to move

the reporting of summary action plans back by a year to provide competent authorities two years from the completion of strategic noise maps to the completion of noise action plans.

The Commission is due to undertake an evaluation and fitness check on the two EU ambient Air Quality Directives during 2018/2019 , which will present another opportunity to more coherently align the two Directives.

5.1.2 DG Environment Science for Environment Policy

In September 2016 European Commission DG Environment published Science for Environment Policy (2016) Links between noise and air pollution and socioeconomic status.[36] The report explores scientific research into the relationship between air and noise pollution, socioeconomic factors and health. In particular, it considers whether some socioeconomic groups suffer worse health as a result of greater exposure and/or vulnerability to air and noise pollution.

The report explores the linkage between socioeconomic factors and exposure to high levels of noise and poor air quality. It provides an overview of the health impacts of noise and air quality, and challenges of interpreting the available research in the area. There is also a chapter on reducing exposure to noise and air pollution which looks at urban planning and development, how to value social cost of noise and air pollution, based on DALYs, and policies to address multiple risk exposures.

The policy discussion is high level, and focuses mainly on promoting more active travel, reducing pollution by encouraging low-carbon transport, and improving access to quiet green spaces away from noisy polluting traffic. The policy discussion also promotes the WHO Health in All Policies[37] (HIAP) approach to policymaking. This promotes the approach in line with the WHO/EC methodological guidance on assessment of noise and air quality impacts in terms of health impacts and DALYs and monetised to promote inclusion within cost benefit and whole-life cost-effectiveness assessments of potential intervention measures.

5.1.3 Wales: Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations Act came into effect in 2015. Whilst this set the scene and expectation for ways of working within central and local government in Wales the policy guidance to local authorities in respect of their LAQM duties was not published until June 2017. Thus, 2018 represents the first year of LAQM reporting in Wales against the new policy guidance and the requirements of the WFG Act.

[36] https://publications.europa.eu/en/publication-detail/-/publication/1a3f0657-9a83-11e6-9bca-01aa75ed71a1/language-en
[37] https://www.who.int/healthpromotion/frameworkforcountryaction/en/

Reviewing publicly available information through local council websites for 2018 LAQM reports many reports show that whilst efforts are made to recognise the needs of the WFG Act, in reality local authorities remain focused on air quality as a single issue. Where recognition of wider impacts of air quality measures with other environmental objectives are made, these are done so through citation of planning and development policies or adopted Supplementary Planning Guidance (SPG) published to developers. More often than not, these wider links are with climate change and reduction of greenhouse gases, rather than noise.

Many local air quality action plans in Wales have been written typically before the WGF Act and new LAQM policy guidance was published. As such, the lack of immediate and wider engagement with noise and other environmental parameters in local air quality action plans can be attributed to this, rather than explicitly an ignoring of the need. It would be anticipated that as local air quality action plans are updated or revised, further explicit links between environmental variables – and with the WGF Act – would materialise.

5.1.4 Scottish Government Local Air Quality Management Policy Guidance

The Scottish Government Policy Guidance PG(S) (16) (revised April 2018) [38] sets out a discussion on air quality and noise which required local authorities to ensure that an integrated approach to managing air quality and noise is taken across all departments.

Whenever air quality action plans prioritise measures in terms of costs and benefits, traffic noise should receive due consideration, qualitatively if not quantitatively. Special consideration should be given to noise management areas identified by the noise action plans particularly where proposed air quality measures may potentially impact on noise levels. Therefore, when developing an action plan, local authorities should bear in mind that there may be consequential effects of introducing a specific measure.

Certain measures, particularly those concerned with reducing local traffic flows, may benefit both air quality and noise, although in some cases this may only hold true when speeds are not permitted to increase. Other potential measures that can reduce both air pollution and noise include restrictions on heavy vehicles, reducing speeds on motorways and dual carriageways, and strategies to increase the separation between the source and sensitive receptors, for example by building a bypass. However, measures to lower average speeds of traffic in urban areas, whilst usually benefitting noise, may increase air pollutant emissions. Modelling may be required to determine the optimum public health outcome for a given locality.

Give the lack of immediate and notable examples of joint air quality and noise action plans in the UK the authors of this report have looked further afield for

[38] https://www.gov.scot/publications/local-air-quality-management-policy-guidance-pg-s-16/

examples of where these may exist. These are considered in further detail below.

5.2 RESEARCH

In 2012 the DG Internal Policies study Towards A Comprehensive Noise Strategy[39] reported that the most obvious link between improving air quality and reducing noise comes in reducing vehicular traffic and hence reducing both exhaust and noise emissions, or promoting the use of electric vehicles in urban areas.

The CityHush project[40] provided a practical example of a measure to reduce both exhaust and noise emissions in the urban area, by creating quiet zones in city centres where only quiet low emission vehicles are permitted, however the validation studies only measured the noise benefit, so any air quality benefits were not quantified.

There have also been attempts to develop an urban environmental quality index "CityNoise-Air"[41] aggregating data for the assessment of air and noise quality of a city and presenting results in the context of standardised legal limits for air pollution and noise, however it has gained wide acceptance since publication in 2012, and would require adaptation for use in the UK where there are no statutory limit values for noise exposure.

5.3 COMBINED ACTION PLANNING BEST PRACTICE

5.3.1 Umwelt Bundesamt Action Sheets, Germany

The German Environment Agency (Umwelt Bundesamt) published a series of 'Action Sheets' which provide guidance on how to reduce airborne pollution[42].

The Action Sheets, which were published in 2009, provide an overview of a number of different road traffic noise reduction measures, alongside a high-level indication of the possible effects on the road traffic, noise, climate emissions and air quality.

The guidance covers the following measures:

- prioritisation of public transport;
- bike sharing;

[39] http://egra.cedex.es/EGRA-ingles/I-Documentacion/EU_Noise_Policy/ENVI_towards_noise_strategy.pdf
[40] http://www.cityhush.org/
[41] https://www.sciencedirect.com/science/article/pii/S2210670712000169
[42] https://www.umweltbundesamt.de/publikationen/massnahmenblaetter-zur-laermminderung-im

- car sharing;
- parking management;
- HGV ban;
- low noise road surface;
- 30 km/h speed limits on major urban roads;
- green wave (i.e. continuous traffic flow);
- use of low noise and low emission technology;
- one-way streets;
- closing of development gaps;
- noise protection walls; and
- soundproof windows.

5.3.2 Umwelt Bundesamt Tempo 30, Germany

The German Environment Agency has published guidance on Noise and climate protection through Tempo 30[43] (Lärm- und Klimaschutz durch Tempo 30: Stärkung der Entscheidungskompetenzen der Kommunen) in March 2016.

The report aimed to develop recommendations for appropriate changes in laws, administrative rules, decrees and regulations to eliminate obstacles faced by municipalities in enforcing “Tempo 30”, 30 km/h speed limits in urban areas.

The revision proposals focused firstly on the question of how current legislation for establishment and implementation of clean air and noise action plans could be clarified and therefore enforced.

A series of proposals were developed to establish sufficient content and to ensure an adequate procedure to assess Tempo 30 arrangements as obligatory measures in clean air and noise abatement plans and to ensure their implementation by the road traffic authorities.

Significant elements of the guidance relate to the legal and administrative barriers to implementing Tempo 30 which exist due the Federal governance

[43] https://www.umweltbundesamt.de/publikationen/laerm-klimaschutz-durch-tempo-30-staerkung-der

structure, and the assignment of competencies for the END, air quality directives and road administration at national, Federal and local levels.

To provide supporting evidence to the implementation of Tempo 30, Umwelt Bundesamt published Effects of Tempo 30 on major roads (Wirkungen von Tempo 30 an Hauptverkehrsstraßen)[44] in November 2016. It brings together evidence from a number of Tempo 30 schemes already in place, and covers the various impacts including speed, traffic flow and travel times, noise, air quality, road safety, displacement onto secondary roads and public perception.

The noise benefits presented included: a 2 dB night-time noise reduction in Frankfurt am Main, including a 4 dB(A) reduction between 5 and 6 am; in Freiburg night levels were measured as 3.1 dB(A) lower; in Zurich 3 dB(A) lower and a Swiss study suggested levels could be up to 4 dB(A) lower. All of the measured results show a larger decrease in noise level than predicted using the national noise calculation methodology.

The air quality benefits are less clearly described, partly due to a small number of empirical studies, but also because it is suggested that the nature of the traffic flow introduced by Tempo 30 will have a more significant impact than the speed reduction. For example if continuous traffic flow or “green wave” is achieved in place of stop-start or congested traffic there can be significant reductions in air pollutants.

5.3.3 Klagenfurt am Wörthersee, Austria

Within the CEMOBIL project[45], 2010-2015, on electromobility the case study in Klagenfurt am Wörthersee, Austria, participated in the 5-year LIFE+ project in pursuit of strategic goals of controlling air pollution, protecting the climate and reducing noise levels in the city.

The project city population of just over 100,000 inhabitants set up 100 charging stations run from 100% green electricity, and purchased 35 E-cars, 5 to be used as taxis, 2 small vans, 10 microcars and an e-bus for Municipality use, and 10 e-bikes and 10 e-scooters for bike loan schemes. There were also encouragement and financial incentives for private purchase of e-vehicles including access to the charging network.

To assess the savings in CO_2-equivalent emissions, a life cycle analysis was conducted under the CEMOBIL project. Over a distance of 707,000 km savings of 67 tonnes CO_2 were achieved. For the entire e-fleet, emissions were reduced by approximately 52%. When using the regional Klagenfurt

[44] https://www.umweltbundesamt.de/publikationen/wirkungen-von-tempo-30-an-hauptverkehrsstrassen
[45] http://www.cemobil.at/index.php?id=5&ID1=5&sprache1=en

electricity mix, the entire Klagenfurt electric fleet emitted 40 tonnes of CO_2/year. On the basis of this approach, emissions were reduced by 85%.

Figure 1. Electric vehicle fleet at in Klagenfurt am Wörthersee[46]

Based on the total number of cars propelled by an electric motor registered in Carinthia in 2015, the annual saving in emission amounts to 2052.3 tonnes of CO_2, 4.71 tonnes of NO_x and 0.54 tonnes of PM_{10}.

An improvement in air quality by 1-2 µg/m^3 of NO_2 will not ensue – as predicted by the calculated scenarios – until a share of 20% has been achieved.

Scenarios were also calculated for noise: A 30% share of e-mobility in a fleet will most probably not reduce traffic noise emission perceptibly in the city centre (-1 dB). However, when referenced against the exposure analysis as specified in the EU Environmental Noise Directive, and taking into account the intended noise level class, a shift of the number of persons exposed towards lower noise level classes can be anticipated. A share of e-mobility in a fleet of more than 70% would be required for a clearly perceptible reduction of immissions (lowering of noise level by 3 dB).

[46] CEMOBIL (2015) promoting E-Mobility. Guidebook for the Implementation of E-Mobility measures in cities and municipalities. Available at: https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiXzv-4icLmAhWMa8AKHZiYBVcQFjAAegQIBRAC&url=http%3A%2F%2Fwww.cemobil.at%2Fdocs%2F58%2Fguidebook_EN.pdf&usg=AOvVaw3dCXNcn99WSfnaoZQdHBHi

5.3.4 Joaquin Project, Antwerp

As part of the Joaquin[47] project, the City of Antwerp municipality developed an approach to integrated action planning on air quality and noise in 2012.

They first developed a methodology to combine the low-resolution background air quality model results, with the high-resolution plume model and street canyon results. This composite result set was used to identify locations exceeding the air quality limits. The results of the round 2 strategic noise mapping were used to identify levels of noise exposure and the numbers of seriously annoyed and sleep disturbed residents.

Three packages of intervention measures were developed with effects on both air quality and noise.

The potential impacts of the measures were assessed using the air quality and noise calculation models, with the impacts compared in terms of the reduction in health impacts, as determined using disability-adjusted life-years (DALYs) in line with the relevant guidance on health impact assessment, with the reduction in noise forecast to have the greater reduction in DALYs. The modelling concluded that the most effective measures were the introduction of low emission zones and congestion charging.

The goals set for 2020 were to reduce the number of residents exposed above 70 dB L_{den} to 0%, improve air quality such that EU and Flemish limits are met and the number of days with excellent air quality increases.

5.3.5 Metropolitan Environmental Noise Prevention Plans, Lille

As part of the 2015 public consultation on the Lille Metropolitan environmental noise prevention plans (PPBE) a cross analysis of air quality and noise in the city of Lille was published alongside the results of the strategic noise mapping.

The study is based on a coupled analysis of noise and atmospheric pollutants NO_2 and PM_{10} emitted by transport infrastructure in order to determine multi-exposure issues and propose solutions for improvement. The analysis was based on the round 2 END strategic noise maps and atmospheric pollution modelling.

The project was undertaken in three phases:

- Phase 1 - Diagnosis and challenges, which aimed to identify and prioritise air pollution and noise multi-exposure zones
- Phase 2 - Preventive and curative measures, which aimed firstly to describe the various preventive and curative measures that exist for

[47] http://www.joaquin.eu/

air pollution and noise, and secondly to propose solutions for the problem areas identified in phase 1.

- Phase 3 - Inventory of actions and impacts, which aimed to list the actions carried out for 5 years and programmed in the 10 years that have an impact on noise and air pollution, then to estimate their impact.

Phase 1 identified just under 600 dwellings (approximately 4,000 inhabitants), within the multi-exposure zones. These were further analysed for degree of exceedance and for the number of inhabitants exposed above the air quality limits and noise thresholds in order to prioritise the identified locations.

Possible intervention measures were set out, with a high-level indication of the potential benefits to air quality and noise that could be achieved if the measure was implemented. Measures are then combined to propose a three-stage implementation plan to address the combined air quality and noise exposure levels at the top two prioritised locations.

This scheme has provided the City of Lille with an evidence base which has been used to encourage residents to modernisation their vehicles and opt for less polluting vehicles through an awareness raising communication plan.

The City of Lille has also used this information to instigate a change in its own vehicle fleet and to encourage partners, such as Transpole, to opt for gas or electric buses.

6 PLANNING SYSTEM RECOMMENDATIONS

Early input into the strategy and design of a development or development plan provides opportunities to maximise achieving an integrated approach to addressing noise and air quality. This holistic approach reduces risks and inefficiencies which may materialise should the related disciplines of air quality and noise be treated separately.

The planning system in Wales is defined within Planning Policy Wales (PPW): Edition 10[48]; this sets out the land use planning polices of the Welsh Government and is supported by a series of Technical Advice Notes (TANs)[49][50], Welsh Government Circulars[51], and policy clarification letters[52].

The principal objective of the planning system is to manage the development and use of land in a manner that contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural wellbeing of Wales.

PPW recognises air quality and soundscape as key components of the natural and built environments, and their importance to the health and wellbeing of people and the environment. Whilst compliance with air quality objectives remains an important aspect in the decision-making process, PPW recognises that these should not be regarded as "safe" limits, and the planning process should seek to deliver air quality conditions that reduce exposure as far as practicable. Likewise, soundscape quality must be preserved where it is good.

Development plans are the basis of the planning system and set the context for decision making. There is a presumption in favour of sustainable development in accordance with the development plan unless material considerations indicate otherwise taking into account social, economic, cultural and environmental issues.

There are three statutory types of development plan:

- The National Development Framework (NDF) sets out Welsh Government priorities, focusing on development and land use issues of national significance;

[48] https://gov.wales/planning-policy-wales
[49] https://gov.wales/technical-advice-notes
[50] The Welsh Government intends conduct a detailed review of Technical Advice Note 11:Noise, with a view to replacing it with a new TAN addressing both air quality and soundscape
[51] https://gov.wales/planning-circulars
[52] https://gov.wales/building-planning

- Strategic Development Plans (SDP) are prepared on a regional basis, addressing issues such as regional housing markets and economic opportunity areas; and

- Local Development Plans (LDP) define how land uses are expected to change over the plan period to accommodate local development needs (e.g. for housing and employment) and define the types of development appropriate for different locations. LDPs need to have regard to local conditions and take into account local well-being plans and area statements.

Place Plans are non-statutory documents used to improve wellbeing and placemaking. They can be used to support the delivery of the LDP polices and may be adopted as supplementary planning guidance.

Planning applications for new development must be determined in accordance with the adopted plans, unless there are material considerations to indicate otherwise.

The Distinctive and Natural Places theme of PPW sets out the framework for addressing Air Quality and Soundscape (Section 6.7). The key planning policy principle is to identify the effects that proposed developments may have on air or soundscape quality, and the effects that existing air quality and soundscape may have on proposed developments. It is the responsibility of developers to address these issues in their planning applications, and to ensure that solutions to mitigate new exposure to poor air quality or soundscape conditions are provided, and that the proposed developments do not significantly affect existing areas in terms of air quality or noise impacts.

The consultants give more detailed consideration to the issues associated with the development of Local Development Plans, Place Plans and planning applications, below.

6.1 LOCAL DEVELOPMENT PLANS

The Local Development Plan Manual – Edition 2 – August 2015, provides guidance to local authorities in preparing LDPs[53][54]. LDP policies and proposals need to be based on a thorough understanding of the area's needs, opportunities and constraints. A key element of Plan preparation is a Sustainability Appraisal (SA), incorporating a Strategic Environmental Assessment (SEA), which provides a robust evidence base to describe environmental conditions, identifies issues and constraints, and evaluates options. The Preferred Strategy then outlines the overall objectives for the

[53] https://gov.wales/local-development-plan-manual-edition-2-2015
[54] Welsh Government published a Development Plans Manual – Edition 3 for consultation in 2019.

Plan and the strategy for growth and change, including the preferred options for major development (and types of development).

6.1.1 Relevant Air Quality and Noise Policies and Guidance

The Local Air Quality Management (LAQM) regime requires all local authorities in Wales to regularly review and assess air quality in their areas. Where exceedances of the air quality objectives are identified, the authority must declare an Air Quality Management Area (AQMA) and devise an Air Quality Action Plan (AQAP) setting out how it intends to implement measures in pursuit of the objectives. Thirteen authorities in Wales currently have declared AQMAs, principally related to exceedances of the annual mean objective for nitrogen dioxide. LAQM Policy Guidance issued by the Welsh Government in 2017 now requires local authorities to take account of noise pollution issues in the development of AQAPs, to maximise opportunities to deliver co-benefits, and to avoid potential conflicts.

Air pollution also has the potential to adversely affect ecological sites, including internationally-designated sites (Special Areas of Conservation, Special Protection Areas/RAMSAR sites), nationally-designated sites (Sites of Special Scientific Interest) and locally-designated sites (Sites of Importance for Nature Conservation, Local Nature Reserves etc.).

Under the Environmental Noise Regulations, Ministers have an obligation to draw up noise and soundscape action plans for places close to major roads and railways, and for agglomerations (>100,000 population). The Noise and soundscape action plan 2018-2023 (December 2018)[55] recognises the key role of placemaking as part of the town and country planning process, bringing together the planning, design and management of spaces.

6.1.2 Identification of Constraints in LDPs

Air quality and noise constraints within LDPs can be based on the relevant actions plans and locations of sensitive areas (as identified above). The following issues are noted:

- It is common practice for Air Quality Management Areas to be identified on a constraints map (although a map is not formally part of the LDP). However, the boundary of the AQMA does not necessarily infer the true extent of current objective exceedances (the AQMA boundary may be larger than the exceedance areas, and local monitoring may indicate compliance). In addition, such constraints maps do not account for how air quality is expected to improve in the future, which is an important issue over the Plan timescale;

[55] https://gov.wales/noise-and-soundscape-action-plan-2018-2023-0

- Noise Action Plans contain Noise Maps that show population exposure to environmental noise and use these data to identify priority areas, and where mitigation is required.

6.1.3 Evidence Base

Many LDPs were produced prior to the publication of recent policies and documents, and might not be expected to show the synergies indicted in PPW and other supporting documents. Two recently published Plans have been reviewed for this study.

Final Sustainability Appraisal Report of the Swansea Local Development Plan (February 2019)

- The Plan recognises issues with peak time congestion in parts of the County with resulting air quality issues, and Plan allocations are dependent on transport improvements being brought forwards. The concept of soundscape is not included;

- Cumulatively, air quality is noted as a significant potential issue both with regard to increased traffic flows and the increase of people living within areas of poor air quality. Additional monitoring is proposed to inform the design process and locations for the provision of dwellings;

- With regard to cumulative impacts, the LDP identifies the need to site noise-sensitive developments such as hospitals, schools and housing away from existing sources of noise (related to Health and Wellbeing). Issues related to air quality are considered separately – the choice of development sites has included consideration of the impact on air quality, and policies aim to ensure no long term significant effects;

- The detailed Technical Report makes reference to enhanced air quality monitoring to inform the planning process, and that discussions will continue on how the desired provisions in some areas can be achieved both in terms of air quality implications and also exposure to noise for those residents; and

- Reference to the Noise Maps and AQMAs are provided, and it is noted that there are synergies between the actions to improve air quality and those required to reduce road traffic noise.

Revised Local Development Plan (2018-2023) Carmarthenshire (December 2018)

- The Strategic Growth Options were tested against the Sustainability Options Framework. Scores against SA3 Air Quality are noted, but there is no specific reference to noise.

6.1.4 Commentary

Within the LDPs reviewed, the assessments are conducted at a high level. Potential constraints are identified with regard to existing conditions for air quality and noise, principally related to expected increases in road traffic. No quantification of the air quality or noise impacts has been undertaken.

There are no obvious conflicts between air quality and noise in the LDP process, but the synergies between potential opportunities and constraints could be made clearer.

6.1.5 Recommendations

- Air quality and noise should be addressed as a combined topic area within the LDP;
- Constraints maps should identify both air quality and noise issues. These should also consider future-year constraints, taking into account projections of baseline conditions. Where baseline conditions improve (e.g. AQMAs may be revoked), consideration should still be given to minimising public exposure as far as practicable; and
- In light of the above, the phasing of development should be considered such that those elements with the highest potential impacts are delayed

6.2 LOCAL AUTHORITY GUIDANCE

Local authorities can shape the impacts of polices within the LDP by providing more detailed guidance at a local level to both influence the design and decision-making processes.

6.2.1 Place Plans and SPGs

Place Plans offer the opportunity to bring together the objectives from the Planning (Wales) Act, 2015 (which seeks to encourage greater community involvement in planning) and The Well Being of Future Generations Act 2015 (which requires planning authorities to take account of the needs of future generations and deliver national well-being goals). They can be embedded in the development plan as an adopted Supplementary Guidance.

The scope of the SPG can be tailored to local needs (including environmental concerns) provided it is consistent with the LDP. It could, for example, include design principles (to encourage better design to minimise public exposure to air pollution and noise) and guidance to developers on the issues that need to be taken into account in planning applications, and how these will be considered in the decision-making process.

By way of example, the WELL Communities Standard provides a comprehensive and interdisciplinary approach to ensure that developments support health and well-being across all aspects of community life. The Standard includes a wide range of concepts including:

- Air – ambient air quality, strategies to reduce traffic pollution and to reduce exposure to pollution; and
- Sound – noise exposure assessment, planning for acoustics, techniques to reduce sound propagation and hearing health education.

A key aspect to the success of such an approach is the consideration of air quality and noise issues at the earliest stage of development. This needs to be supported by policies which actively seek to reduce air/noise exposure in the private and public realms, and, wherever possible, to remove or reduce the impact of pollutant emissions and unwanted noise. Importantly, these concepts should be applied to all development, not only those that lie within areas of poor air quality or poor soundscapes. New developments can reduce both emissions and public exposure by better design. The former can be achieved by incorporating design elements into schemes that promote the uptake of sustainable forms of transport. Public exposure can be minimised by the careful selection of land-use choices, and by extending the pathway between emission sources and public exposure, using building forms and layouts to separate vulnerable populations from the sources (such as busy roads).

The Welsh Government intends to revise TAN11 to cover both noise and air quality issues and there is an opportunity to set out the requirements to encourage a more holistic approach to assessments in the light of broader health and well-being aspirations, and to set out how this should be demonstrated to the local planning authority.

An assessment of existing air quality and noise conditions should be considered prior to the start of any design work, together with the constraints and opportunities this offers. Where necessary, this may include numerical predictions, but may also include an audit of local conditions and pollution/noise sources.

Design hierarchies should be applied which seek to:

- Design out new sources of pollution/noise;
- Use building forms to promote dispersion of pollution and screen sensitive areas from pollution/noise sources;

- Use scheme layouts to maximise distances between sources and receptors;

- Ensure designs and layouts encourage the uptake of sustainable travel choices, through providing easy access to public transport, prioritisation of cycle parking, cycle and pedestrian routes; and

- Encourage transport plans that promote Design – Choice – Behaviour, quantify the associated benefits, and wherever possible, extend these benefits to the wider community.

6.2.2 Recommendations

- The revision to TAN11 should set out the requirements for air quality and noise issues to be dealt with in a holistic manner. This should require consideration of any potential constraints and/or opportunities at the earliest stages and well before scheme freeze;

- Mitigation should be recognised as a means of offsetting significant air quality and/or noise effects, but only when best-practice design has been applied at the early stages of a scheme; and

- Statements should be submitted with planning applications demonstrating a) how proposals have considered ways to maximise benefits to local air quality/soundscapes, and b) what measures or design features will be put in place to reduce exposure to pollution and noise, and how they will achieve this.

6.3 PLANNING APPLICATIONS

Air quality and/or noise assessment are normally required to support planning applications where significant effects are likely. Depending on the scale and nature of the development, such assessments may be stand-alone or form part of a formal Environmental Statement (under the Environmental Impact Assessment (Wales Regulations, 2017[56]). A screening process determines whether a proposed scheme requires an environmental impact assessment (EIA). Local planning authorities may provide a scoping opinion, as to what information is required as part of the EIA.

6.3.1 Management of EIAs and Small Scheme Assessments

Formal EIAs are typically undertaken when a large scheme is being proposed where a wider range of environmental issues needs to be considered. EIAs are often large projects which require a degree of centralised management and coordination. It is common for large EIAs to be relatively well funded therefore allowing a comprehensive assessment of impacts using relevant

[56] https://www.legislation.gov.uk/wsi/2017/567/contents/made

measurement, monitoring and/or modelling techniques. Nowadays standardised information on the scheme design is often shared between the discipline teams, e.g. building design, traffic movements, etc.. It is increasingly common for assessments to be controlled through shared and controlled IT environments.

Smaller schemes that do not require formal EIAs and require information on a more limited range of environmental parameters tend also to be smaller in scale. Therefore they also tend to have a smaller budget for environmental assessments.

These factors often result in individual discipline teams being commissioned separately by the developer. In such cases it is quite possible for data to differ between environmental discipline teams and for any modifications to the scheme not being communicated between teams. In such a scenario there is a greater risk that opportunities to coordinate the design or mitigation to maximise co-benefit are missed as teams focus on the objectives of their contract, rather than the scheme as a whole.

6.3.2 Timing of Environmental Assessment

Early input into the strategy and design of a development or development plan also provides opportunities to maximise achieving an integrated approach to addressing noise and air quality. This holistic approach reduces risks and inefficiencies which may materialise should the related disciplines of air quality and noise be treated separately.

6.3.3 Example Scenarios

Two hypothetical schemes representing common planning scenarios are presented below to highlight examples of how co-benefit might be achieved through early intervention and coordinated management.

Residential dwelling design

Residential developments built in areas comprising high environmental noise levels and poor air quality will often benefit from specially designed façade schemes.

Co-ordination of the acoustic and air quality mitigation properties required at an early stage has the benefit of ensuring the façade design is suitable for both aspects and reduces the risk of two different sets of mitigation measures being designed and costed for, often by different experts, which may in fact not be suitably complementary which could lead to design changes at a later stage. For example, there may be a need to consider the issue of weight of the glazing with enhanced acoustic and air quality filtration properties and its feasibility into the overall design and build of the structure.

Consideration of other requirements beyond noise and air quality could also mitigate risks in producing an unsuitable development. For example, designing a dwelling with sealed windows may be of benefit for acoustic and air quality design purposes but could cause issues with overheating or damp and mould due to inadequate ventilation, particularly purge ventilation. This in turn could lead to category 1 or 2 hazards being identified under the Housing Act 2004 thus requiring remedial works to the property at a later stage.

Road schemes

Risks and inefficiencies associated with strategic road scheme design include not fully realising the benefit of joined up mitigation approaches and/or unintended consequences of mitigation measures. For example, traffic calming schemes to manage air quality may cause noise issues, for example the use of chicanes or speed bumps. Furthermore, specific mitigation measures such as noise barriers or mounds could impact negatively upon air quality and also the displacement of traffic from one road to another for noise or congestion reasons could lead to a worsening of air quality on the new routes.

These risks highlight the importance of considering noise and air quality together when designing road schemes to reduce these risks, but additionally there are benefits in joined up mitigation for example, the selection and planting of vegetation with both noise and air quality mitigation properties at the outset.

6.3.4 Barriers

Whilst the benefit of an integrated approach to addressing noise and air quality is recognised, it is acknowledged that there are barriers and challenges which can prevent its effective implementation. These can be broadly divided into technical and administrative barriers.

Examples of technical barriers include incompatible mitigation measures such as the inclusion of acoustic and air quality mitigation measures in façade design may increase the overall weight of the glazing specification, which could in turn lead to design or engineering issues. A further example is during the construction phase where mitigation for dust such as water suppression may lead to noise complaints from the pumps in use.

Administrative issues can include factors such as many noise standards within the development planning process being objective, thus making it appear easier to demonstrate compliance, for example planning conditions for noise are more likely to include objective and measurable levels to be met whereas air quality planning conditions may be sometimes be based around compliance with approved mitigation measures.

Personnel involved in assessing and designing mitigation measures for noise and air quality generally have expertise in one or other discipline, with specialist reports often written and assessed separately. This can lead to missed opportunities in mitigation design or the implementation of mitigation measures which have competing requirements which could limit their effectiveness. Improving multi-disciplinary working and merging expertise where feasible could assist in improving overall outcomes, including improved mitigation at a reduced cost of delivery. Adopting a greater standardisation of compliance 'metric', e.g. by using a health or economic indicator, may also encourage more joined up working.

6.4 STRATEGIC RECOMMENDATIONS

There are several areas where greater levels of coordination can lead to improved consideration of air quality and noise/soundscape.

Within this chapter, reference is made to different types of plan, which are created by different tiers of government or authority. The scale of the evidence base or detail of constraint can therefore vary, depending on the level at which the information has been created, or is being used. Much of this information is map based. In modern digital mapping systems, it is increasingly possible for one 'authority' to be responsible for holding a definitive dataset relating to an environmental parameter or baseline condition. The currency and quality of this data is, however important.

Currently, for example, strategic noise maps are produced on a five yearly basis. They cover part of Wales (major transport routes and agglomerations) but there are significant areas of Wales that are not covered. The relatively long interval time between map publications also means that localised development changes that occur within the 5-year update period are not captured for months or years and therefore reducing the value of the map as an evidence base.

As a result of the way the air quality regime operates in the UK, both local authorities and central government hold data and maps showing emissions and air pollution concentrations. However this information is produced to different technical specifications and therefore does not show a consistent picture. This can lead to confusion and complications in developing coordinated local and national plans for air quality improvement.

Both issues emanating from these examples could be resolved through development of a single scaleable evidence base for each discipline. This would involve investment in IT and digital mapping/modelling to create a standardised and accessible map. It would also require agreement and coordination between the various parties who would play a role in developing, maintaining and using the data. Updates could be made on a rolling basis

with agreed 'freeze' periods, e.g. annual. Such an approach would enable further benefits.

With an agreed standardised evidence base, the maps and underlying models could be utilised by developers to 'run' scenarios in which their schemes are modelled and saved for review, or approval, by planning officers. This would mean environmental assessments for proposed development should be directly comparable with the authority's baseline evidence base. Officers evaluating a scheme should have a clearer understanding of the basis of the assessment. This approach is operated in the Netherlands in conjunction with zoned map-based areas for air quality and noise level and the Environment Agency is developing this type of system to provide a single standardised flood map of England[57]. With standardised air quality and noise/soundscape evidence layers, it would be possible to coordinate and combine significant quantities of 'input' data to create a shared air quality and noise/soundscape base model (geospatial database). Detailed guidance on model parameterisation would also improve consistency between different practitioners. As a significant portion of the cost of developing and maintaining environmental models is associated with input data, this could lead to a considerable cost saving and/or added value.

Obstacles, such as the move away from proprietary software towards standardised open source mathematical models, algorithms and code have been overcome in the development of the Common Noise Assessment Methods for Europe (CNOSSOS-EU). With the departure from the EU being imminent and creating the need to revisit environmental regulations, there is an opportunity to develop a smart dynamic, joined up digital evidence base, which supports planning and health and wellbeing based policy making.

Within the development planning process, opportunities to approach air quality and noise should be explored at an early research stage. Expertise in both disciplines should be sought to assess topics such as the allocation of sites and the assessment of the development of infrastructure. It is recommended that noise, including soundscape and quiet areas, are included as an environmental topic for consideration in the designation of a strategic development plan area, as it is not currently a topic for identification as defined in Designating a Development Plan Boundary and Establishing a Strategic Planning Panel (SPP), March 2019[58].

The cumulative impacts of noise and air quality should also be given careful consideration particularly in the design and development of infrastructure, which could lead to exposure to both.

[57] National Flood Risk assessment 2 (NaFRA2)
[58] https://gov.wales/strategic-development-plans-guidance-local-planning-authorities

7 CONCLUSIONS

From a review of the LAQM process and implementation of the END, the two policy regimes which gave birth to air quality and noise action planning, a number of conclusions can be drawn. These include:

- the policy implementation models for air quality and noise action planning differ significantly from one another. Air quality action plans have a greater degree of UK wide coordination, e.g. through prescriptive guidance such as LAQM.TG(16). They are implemented by many local authorities who can adopt differing approaches and do not have standardised technical methodologies, or technical assessment approaches;

- noise has undergone a greater degree of devolution with four, similar, but different implementation models across the UK. The noise action planning process, especially in Wales, England and Scotland has remained the competency of national government, albeit with close engagement with local authorities and stakeholders in Wales and Scotland through formal engagement structures. The underpinning noise 'mapping' is consistent within each of the nations;

- the timing of action planning is different for air quality and noise. Noise action plans operate on a 5-year cycle, whereas air quality action plans are updated and/or screened on an annual basis. The historical timing differences are likely to have been a significant factor in preventing the action plans from integration;

- air quality has prescriptive objective targets to drive the policy, whereas action planning targets for noise are arguably less stringent. This tends to create a focus on achieving air quality targets, potentially seeing noise as an inhibitor, rather than a closely related topic from which co-benefit might be achieved by a coordinated approach; and

- the emergence of a health based approach to environmental policy has created a framework in which a more balanced set of objectives can support and encourage a more coordinated approach to air quality and noise action planning. In Wales, the Wellbeing of Future Generations Act 2015 is a significant policy to support this approach.

From a review of relevant mitigation measures relating to air quality, the following was concluded:

- formal classification schemes of air quality action planning measures were identified in annual reporting templates (and the EU measures list) and in LAQM.TG(16);

- the EU measures list and that in LAQM.TG(16) are very similar, with over 90% being identical, apart from a small number of measures that only appear in the EU list and a measures category relating to modelling and assessment methodologies which only appears in LAQM.TG(16);

- from a review of the 49 measures in the 2001 Report which related to road, rail and industry sources it was concluded that all but one of the measures was still relevant today;

- the relevant 2001 Report measures were integrated with the current air quality measures to produce an updated schedule of air quality and noise measures. With the inclusion of one additional measure relating to vegetation screening, the updated schedule comprises of 85 measures. These are set out in Appendix II;

- each of the measures was assessed for the potential for there to be a synergy or conflict in relation to air quality or noise. Each measure was rated as having the potential to have a positive, neutral or negative effect;

- a number of measures have the potential to have a positive effect if designed well, however they can also have the potential to have a negative air quality and/or noise effect if not designed or planned appropriately;

- analysis of the ratings shows that the potential to deliver benefit to both air quality and noise exists for the large majority of measures. The risk of conflict is greatest for measures such as increasing or decreasing road traffic speeds and measures relating to industrial zoning and operation; and

- it was noted that in order to achieve significant change or to maximise benefits, most schemes are likely to include a combination of measures and the ultimate outcome will be determined by the detail of their design and implementation. It is important not to look at outcomes in isolation: the cumulative impact of interventions is important.

8 RECOMMENDATIONS

There are several recommendations which emerge from this project including:

- consideration be given to aligning the timing of future noise and air quality action plan assessments and reporting cycles. This will help facilitate joint assessment and reporting. The current annual cycle for AQ reporting works well with managing updates to data and data licensing, which tend to work on annual updates, and helps to maintain a currency to work;

- consideration be given to an integrated approach to air quality and noise action planning. This will help to avoid conflicts in respective action planning, but with a significant number of measures being beneficial to both disciplines there is a strong chance of co-benefit being achieved efficiently, if planned together;

- considering a joint approach to air quality and noise action planning in order to help facilitate wider policy developments, e.g. in Wales, updating of TAN11: Noise and future policy relating to soundscape;

- maintaining a single integrated schedule of air quality and noise mitigation measures. This will enable a structured approach to decision making on schemes and help structure guidance and reporting. This will additionally assist with the recording and reporting of measures within electronic systems and will enable greater coherency of external dissemination, e.g. via open data publication;

- evaluating how future noise assessment methodologies, such as that set out in Directive 2015/995 (CNOSSOS-EU) or developed through BSi Committee EH/1/2 on Transport Noise, might be implemented to either draw upon, or support joint assessments of air quality;

- investigating efficiencies and cost saving potential of joint technical assessments for action planning, including sharing input data, modelling methodology (e.g. 3D design) and joint modelling exposure assessment;

- harnessing the potential of modern datasets and the digital asset modelling approaches such as ‘digital twinning’ which provide the fidelity to support joint assessment (e.g. detailed/flexible traffic data classification) and be based around a standardised and scalable approach which enables sharing of data across different tiers of authority/user (through coordinated licensing, IP management and proactive agreements); and

- consideration be given to reporting the benefits of action planning in terms of ultimate health or wellbeing improvement using appropriate metrics as opposed to numbers of people exposed to a particular band of pollution levels. This applies in particular to noise exposure reporting under the END.

APPENDIX I. EU AIR QUALITY MEASURES

EU Measure Category	EU Measure Classification
Alternatives to private vehicle use	Bus based park & ride
	Car & lift sharing schemes
	Car clubs
	Rail based park & ride
	Other
Environmental permits	Introduction/increase of environment charges through permit systems and economic instruments
	Introduction/increase of environmental funding through permit systems and economic instruments
	Large combustion plant permits and national plans going beyond BAT
	Measures to reduce pollution through IPPC permits going beyond BAT
	Other measure through permit systems and economic instruments
	Tradable permit system through permit systems and economic instruments
	Other
Freight and delivery management	Delivery and service plans
	Freight consolidation centre
	Freight partnerships for city centre deliveries
	Quiet & out of hours delivery
	Route management plans/strategic routing strategy for HGVs
	Other
Policy guidance and development control	Air quality planning and policy guidance
	Low emissions strategy
	Other policy
	Regional groups co-ordinating programmes to develop area wide strategies to reduce emissions and improve air quality
	Sustainable procurement guidance
Promoting low emission plant	Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources
	Low emission fuels for stationary and mobile sources in public procurement
	Other measure for low emission fuels for stationary and mobile sources
	Public procurement of stationary combustion sources

EU Measure Category	EU Measure Classification
	Regulations for fuel quality for low emission fuels for stationary and mobile sources
	Shift to installations using low emission fuels for stationary and mobile sources
	Other policy
Promoting low emission transport	Company vehicle procurement - prioritising uptake of low emission vehicles
	Low emission zone (LEZ) or clean air zone (CAZ)
	Priority parking for LEVs
	Procuring alternative refuelling infrastructure to promote low emission vehicles, EV recharging, gas fuel recharging
	Public vehicle procurement - prioritising uptake of low emission vehicles
	Taxi emission incentives
	Taxi licensing conditions
	Other
Promoting travel alternatives	Encourage / facilitate home-working
	Intensive active travel campaign & infrastructure
	Personalised travel planning
	Promote use of rail and inland waterways
	Promotion of cycling
	Promotion of walking
	School travel plans
	Workplace travel planning
	Other
Public information	Via leaflets
	Via other mechanisms
	Via radio
	Via television
	Via the Internet
	Other
Traffic management	Anti-idling enforcement
	Emission based parking or permit charges
	Reduction of speed limits, 20 mph zones
	Road user charging (RUC) / congestion charging
	Strategic highway improvements, re-prioritising road space away from cars, incl. access management, selective vehicle priority, bus priority, high vehicle occupancy lane
	Testing vehicle emissions
	UTC, congestion management, traffic reduction
	Workplace parking levy, parking enforcement on highway
	Other
Transport planning and	Bus route improvements

EU Measure Category	EU Measure Classification
infrastructure	Cycle network
	Public cycle hire scheme
	Public transport improvements - interchanges stations and services
	Other
Vehicle fleet efficiency	Driver training and eco driving aids
	Fleet efficiency and recognition schemes
	Promoting low emission public transport
	Testing vehicle emissions
	Vehicle retrofitting programmes
	Other

APPENDIX II. UPDATED AIR QUALITY AND NOISE MEASURES

Key:

Attribution:

- TG(16) = Measures set out in LAQM.TG(16)
- EU = Measures set out in the EU measures List (from LAQM ASR Template)
- 2001 = Measures set out in the 2001 Report and not included in LAQM.TG(16) or the EU List
- 2019 = Measures not included above and included by the authors of this report.

Ref No.	Attribution	Combined (LAQM.TG(16), EU and 2001 Report) Measure Classification
Traffic management		
1	TG(16)	Urban Traffic Control (UTC), congestion management, traffic reduction
2	TG(16)	Reduction of speed limits, 20mph zones:
3	TG(16)	Road user charging (RUC) / congestion charging.
4	TG(16)	Anti-idling enforcement
5	TG(16)	Testing vehicle emissions (for AQ and noise)
6	EU	Emission based parking or permit charges.
7	EU	Workplace parking levy, parking enforcement on highway
8	EU	Strategic highway improvements, re-prioritising road space away from cars, incl. access management, selective vehicle priority, bus priority, high vehicle occupancy lane
9	2001	Pedestrianisation
10	2001	Road tables
11	2001	Speed increase from 30 to 40-50 mph
Promoting travel alternatives		
12	TG(16)	Workplace travel planning
13	TG(16)	Encourage / facilitate home-working
14	TG(16)	Personalised travel planning

15	TG(16)	School travel plans
16	TG(16)	Promotion of cycling
17	TG(16)	Promotion of walking
18	TG(16)	Promote use of rail and inland waterways
19	EU	Intensive active travel campaign & infrastructure

Public information

20	EU	Via leaflets
21	EU	Via the Internet
22	EU	Via radio
23	EU	Via television
24	EU	Via other mechanisms

Transport planning and infrastructure

25	TG(16)	Public transport improvements - interchanges stations and services
26	TG(16)	Public cycle hire scheme
27	TG(16)	Cycle network
28	TG(16)	Bus route improvements
29	2001	Road tunnels
30	2001	Metros or light transit system
31	2001	Roadside and railside noise / environmental barriers
32	2001	Mounding
33	2001	Quiet surfacings
34	2001	Train skirts

Alternatives to private vehicle use

35	TG(16)	Bus based park & ride
36	TG(16)	Car & lift sharing schemes
37	TG(16)	Car clubs
38	TG(16)	Rail based park & ride

Policy guidance and development control

39	TG(16)	Regional groups co-ordinating programmes to develop area-wide strategies to reduce emissions and improve air quality
40	TG(16)	Air quality planning and policy guidance

41	TG(16)	Sustainable procurement guidance
42	TG(16)	Low emissions strategy
43	2001	Stricter development controls
44	2001	"Buffer" zones
45	2001	Heavy/light industry zones
46	2001	Relocation
47	2001	Property insulation grant scheme
48	2001	Local bypasses
49	2001	Siting new roads away from properties
50	2001	Building layout/orientation
51	2019	Vegetative screens

Freight and delivery management

52	TG(16)	Freight consolidation centre
53	TG(16)	Route management plans / strategic routing strategy for HGVs
54	TG(16)	Quiet & out of hours delivery
55	TG(16)	Delivery and Service plans
56	TG(16)	Freight partnerships for city centre deliveries
57	TG(16)	Transfer of freight to rail

Vehicle fleet efficiency

58	TG(16)	Driver training and eco driving aids
59	TG(16)	Promoting low emission public transport
60	TG(16)	Vehicle retrofitting programmes
61	TG(16)	Fleet efficiency and recognition schemes
62	TG(16)	Testing vehicle emissions

Promoting low emission transport

63	TG(16)	Low emission zone (LEZ) / clean air zone (CAZ)
64	TG(16)	Public vehicle procurement - prioritising uptake of low emission vehicles
65	TG(16)	Company vehicle procurement - prioritising uptake of low emission vehicles
66	TG(16)	Procuring alternative refuelling infrastructure to promote low emission vehicles, EV recharging, gas fuel recharging.
67	TG(16)	Priority parking for LEVs

68	TG(16)	Taxi licensing conditions
69	TG(16)	Taxi emission incentives

Promoting low emission plant

70	TG(16)	Public procurement of stationary combustion sources
71	TG(16)	Low emission fuels for stationary and mobile sources in public procurement
72	TG(16)	Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources
73	TG(16)	Other measure for low emission fuels for stationary and mobile sources
74	TG(16)	Regulations for fuel quality for low emission fuels for stationary and mobile sources
75	TG(16)	Shift to installations using low emission fuels for stationary and mobile sources

Environmental permits

76	TG(16)	Introduction/increase of environment charges through permit systems and economic instruments
77	TG(16)	Large combustion plant permits and national plans going beyond BAT
78	TG(16)	Measures to reduce pollution through IPPC permits going beyond BAT
79	TG(16)	Tradable permit system through permit systems and economic instruments
80	TG(16)	Type approval/CE tests on wood burning stoves
81	2001	Use of "self-screening" factory buildings

Improving AQ (and noise) modelling and assessment

82	TG(16)	Improving modelling predictions
83	TG(16)	Tools to assess traffic management schemes prior to implementation
84	TG(16)	Tools to evaluate measures to reduce traffic emissions
85	TG(16)	Investigating specific measures and issues to understand their air quality impact