

UPDATING THE SYNERGIES AND CONFLICTS BETWEEN NOISE AND AIR QUALITY ACTION PLANS

NE Jones Extrium
MKE Burdett Extrium
R Maggs Bureau Veritas UK
SJ Shilton Acustica

1 INTRODUCTION

In 2000/2001, the UK Government acting through the Air and Environmental Quality Branch of the then Department of Environment, Transport and the Regions (DETR) and in conjunction with the Department of the Environment Northern Ireland (DOENI), the National Assembly for Wales (NAW) and the Scottish Executive (SE), commissioned a research report entitled the “Determination of the Potential Synergies and Conflicts Between Noise and Air Quality Action Plans”¹ (2001 Report).

The 2001 Report was drafted shortly after the introduction of the Local Air Quality Management (LAQM) regime and in advance of Directive 2002/49/EC relating to the assessment and management of environmental noise - the so-called Environmental Noise Directive (END)² - entering into force.

In the intervening period since the 2001 Report, there have been many developments which have influenced the way in which air quality and noise action plans have been implemented.

Following recent policy developments in Wales, the Welsh Government commissioned a review of the 2001 Report against current technical practice and implementation approaches with the aim of evaluating whether the original synergies and conflicts still hold and to update with new evidence or make recommendations to enable greater synergies to be developed, where relevant.

Extrium, working in conjunction with Acustica and Bureau Veritas have undertaken the project which has considered how air quality and noise action plan implementation differs now compared to the 2001 Report; reviews the 2001 Report measures in the context of current action plan mitigation measures and puts forwards recommendations for a greater alignment of air quality and noise action planning in the future. Interim findings are set out in this paper.

2 CHANGES SINCE THE 2001 REPORT

The 2001 Report was drafted shortly after the introduction of the Local Air Quality Management (LAQM) regime and in advance of Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive – END).

The 2001 Report also reflects the thinking at the time, that noise action planning would be likely to be implemented along the same lines as LAQM, with local authorities taking a lead in the development of action plans.

In the intervening period there have been significant changes across the UK that have led to an evolution of LAQM policy and which led to a fundamentally different implementation of END than was anticipated at the time of the 2001 Report.

Perhaps the most significant changes have come about as a consequence of devolution and from lessons learned from experience; 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.

2.1 Evolution of LAQM

The 2001 Report was drafted shortly after the introduction of the Local Air Quality Management (LAQM) regime.

Part IV of the Environment Act 1995³ set down the legislative drivers for appraisal and assessment of local air quality in local authority areas, such that locations identified through the assessment process deeming to fail in complying with relevant air quality standards would be declared as an Air Quality Management Area (AQMA). In Northern Ireland Part III of the Environment (NI) Order 2002⁴ provides the statutory duty.

LAQM saw local authorities across the UK systematically reviewing and assessing a series of air quality pollutant concentrations against a set of air quality objectives and then developing local air quality action plans (AQAPs) where concentrations were expected to exceed the objective levels.

The process leading to the development of AQAPs and the requirements has been implemented in a relatively joined up way across the UK. The duties of Local Authorities are broadly the same and the technical approaches undertaken in the implementation of LAQM have been relatively consistent, being based upon common or combined Guidance and technical resources published by Defra in conjunction with the respective devolved administrations of Northern Ireland, Scotland and Wales. Local authorities are able to draw upon UK wide helpdesk and all AQAPs and associated update reports (see below) produced in the UK are appraised by a single team, with details of air quality mitigation measures being recorded in a single database.

The first round of assessment under the LAQM regime arose in 1998 and increased knowledge and understanding of emissions and air quality dispersal has arguably increased considerably in the intervening years and there is much that has evolved in the LAQM regime as a result of specific focus by each of the devolved Parliaments. In response to an increasing focus on national policy priorities and to an extent due to the political situation in Northern Ireland, the implementation of LAQM is perhaps evolving to reflect more regional requirements. This is typically evidenced in the latest LAQM Technical Guidance (LAQM.TG16)⁵, published in February of this year.

The primary methods and assessment tools of appraising emission sources and their impacts on air quality remain consistent across the UK where technical guidance provided by Defra (LAQM.TG16) remains over-arching in all areas with the exception of London.

LAQM.TG16 sets out requirements of the 'phased' approach being followed in Northern Ireland and the new 'streamlined' approaches being undertaken in England, Scotland and Wales. This is further reflected in the current LAQM reporting approaches, with local authorities in England being required to submit Annual Status Reports; local authorities in Scotland and Wales being required to submit Annual Progress reports; whilst local authorities in Northern Ireland continue to follow the requirements of the previous LAQM regime which includes a combination of Progress Reports, Updating and Screening Assessments and Detailed Assessments.

A London-specific technical guidance (LLAQM.TG16)⁶ has been provided to London Boroughs to follow in the undertaking of their LAQM duties, which seeks to achieve the same streamlining of reports elsewhere across the UK, but to take account of specific issues pertaining to London and the available data sets on modelling undertaken by the GLA at Borough level.

When considering the measures to implement in their air quality action plans, local authorities are required to have due regard to the main emission sources contributing to the exceedance in the AQMA, and also to consider the costs and feasibility of implementing such targeted measures. The appraisal of measures should consider the wider impacts of implementing the air quality specific focus such that impacts on wider socio-economic, accessibility, other environmental consequences. In this way, a potential "win-win" in implementation of the air quality measures should be achieved. Greater emphasis is also now placed on 'soft' measures designed to encourage awareness and behaviour change amongst the public. Such measures include media awareness campaigns.

Notwithstanding the recent developments in the LAQM process, 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 actions to improve local air quality – and therefore make a contribution to the compliance to EU limit values – a standard reporting template⁷ is now provided to local authorities formulating action plans for the first time, or where a need to revise and update an existing action plans arises. This standard reporting template in England sets out a classified list of air quality action plan measures.

The move to a consistent codification of action plan measure 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 NO₂ against the EU limit values).

The 2001 Report considered 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 the language used by local authorities in their consideration to measures adopted for air quality in their action plans. In contrast the EU categories adopted under LAQM reporting arguably better represent the approaches to measures that wider stakeholders and the public will understand:

- 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
- Other.

LAQM TG16, includes an additional non-EU class of measure:

- Improving AQ modelling and assessment.

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 / negative of neutral are, by and large still relevant.

2.2 Implementation of END

At the time of the 2001 Report, implementation of Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive - END) was being considered by Member States. Foremost in the minds of officials was consideration as to how best to implement the technical activity of strategic noise mapping and the resultant noise action plans.

LAQM had just started to be implemented and due to the obvious similarities in the nature of noise and air pollution sources that were being considered (in the case of air quality) and would have to be considered (in the case of noise) it was initially anticipated that END would be implemented along similar lines to that of LAQM – with local authorities being assigned the competency for assessing (making strategic noise maps) and producing noise action plans (NAPs).

The 2001 Report was also drafted at a time when devolution was in its infancy. Some powers had been assigned to the Scottish Government (the then Scottish Executive), but it was expected that the END would be implemented through UK legislation with competency functions being assigned in a broadly equivalent way to LAQM.

Early drafting of the Environmental Noise Regulations was conducted on a UK wide basis; however this period also coincided with the (2002-6) Noise Mapping England (NME) project being undertaken in England by Defra. The NME project had domestic policy drivers, most notably the Rural White Paper⁸, and it provided an opportunity to learn lessons from undertaking the technically complex task of noise mapping. Lessons were soon learnt about the management challenges of noise mapping, such as the cost, how to manage data licensing and how to interpret results from a non-standardised process.

Although the NME project's main focus was on the production of strategic noise maps, rather than on action planning, it was becoming apparent from the experiences of LAQM, that there were challenges with respect to the effectiveness of local authorities being responsible for controlling pollution exceedances where the main contributor was under the authority of another organisation or government body.

For the reasons above, the END was transposed in a largely centralised implementation model with the duty for the production of strategic noise maps and noise action plans largely being the responsibility of central government (the Secretary of State).

The process of END transposition also coincided with increased levels of devolution. This also resulted in the Devolved Administrations taking on responsibility for drafting their own Environmental Noise Regulations. With four eventual implementations in 2006 across the UK, it is unsurprising that there are some differences between the four sets of regulation. Despite further amendments having been undertaken in the intervening years, the main aspects of the regulations implementing the END across the UK have remained largely unchanged.

The END and implementing regulations, require strategic noise maps and associated noise action plans to be developed on a 5-year cycle. Following from the first round of strategic noise mapping in 2007, there have been further rounds of mapping (2012 and 2017).

Two rounds of noise action planning have been undertaken across the UK with a third underway, following the 2017 mapping exercise. Implementation detail associated with the noise action planning process varies across the UK, however opportunities exist for consideration of wider environmental benefit, such as air quality.

The net result of END transposition is that noise action planning and air quality action planning have been implemented in very different ways across the UK – with legal duties resting with different authorities and the cycles of action plan development and reporting being offset from one another in timescale. In essence the two regimes have been fundamentally disconnected from one another.

2.3 Other Changing Factors

Besides changes in the LAQM regime and the END being transposed in a more centralised model, there have also been a number of 'external' developments which have the potential to influence how AQAP and NAP work in practice today and how they may be influenced in the future.

In the last 17 years, technology has evolved dramatically. We stand at a new dawn in mainstream road vehicle power technology. Hybrid engines have been in existence for over a decade, however new drives by government to tackle air pollution exceedances and to move the vehicle fleet to electric by 2040 will inevitably see a significant change in the nature of emissions in the coming years.

The technology supporting practitioners in air quality and noise assessment is also evolving. Key to understanding the detail in modelling and monitoring assessments is quality of data. The expansion in digital spatial data, advances in computing and increasing availability of sensors enabling detailed traffic counts and greater coverage of noise and air quality levels means it is possible to understand the causes and attribution of pollution in a way that has not been possible before. Along with platforms provided by mobile technology and data publication such as application programming interfaces (APIs), the public can now access and consume far more information and analysis on pollution – both in terms of what they might be contributing to overall pollution levels and to what they may be exposed to. Public awareness has changed.

At a policy level it might at first seem disappointing that air quality and noise seemed to initially divert in their respective implementation pathways. However recent policy developments, most notably in Wales through the cross-cutting policy framework set by the Well-being of Future Generations (Wales) Act 2015⁹ (“the WFG Act”) and the publication of LAQM guidance¹⁰ in 2017 are seeing a move towards a joined up approach to noise and air quality action planning. This more joined up approach between noise and air quality (and other pollutants) is also reflected in the draft London Environment Strategy¹¹, the REFIT Evaluation of END¹² and the recent annual report from the Chief Medical Officer¹³.

It is also recognised that practitioners at the coalface of delivering improvements on noise and air quality, typically local authority officers, have encountered greater demands on their resources in the intervening years.

3 REVIEW OF 2001 MEASURES

Following the 2001 Report, there has arguably been a greater development and formalisation of measures in air quality, relative to noise. The EU classified list of air quality action plan measures therefore provides for a natural benchmark against which the measures in the 2001 Report can be compared. The review focused on road, railway and industry related measures.

3.1 Review Methodology

The measures from the 2001 Report measures were initially compared against the EU AQ measures. Where relevant, measures were ‘matched’ where there was a significant similarity in the description or nature of the measure. Measures that did not align well with the EU AQ measures were placed into a group of ‘Other’ measures - due to the nature of the two sets of measures; these were primarily measures delivering a stronger noise benefit compared to air quality.

Four additional measures, based on those set out under ‘Improving AQ modelling and assessment’ in Table A.1, Annex A: LAQM Action Toolbox of LAQM TG16, were also included. The definition of the modelling and assessment measures was intentionally broadened to make reference to the modelling and assessment of noise – the process being technically similar for both pollutants.

Once the lists had been integrated into a single list of measures, consideration was given to the noise and air quality synergy or conflict rating – whether ‘positive’, ‘neutral’, ‘negative’ or ‘scheme specific’. This was done respectively for air quality and noise measures, starting first by reviewing those measures with a pre-existing rating from the 2001 Report and then by completing additional new ratings for the additional measures not covered by the 2001 Report.

The results of the review are set out in Table 1, below.

3.2 Comparison of 2001 Report Measures

Table 1. Results of the Updated Review of AQ and Noise Synergies and Conflicts

Ref. No.	EU Measure Category	EU AQ Measure Classification	Noise - Positive	Noise - Neutral	Noise - Negative	Noise - Scheme specific	AQ - Positive	AQ - Neutral	AQ - Negative	AQ - Scheme specific	In 2001 Report
1	Alternatives to private vehicle use	Bus based Park & Ride				√				√	x
2		Car & lift sharing schemes	√				√				
3		Car Clubs	√				√				
4		Rail based Park & Ride				√				√	x
5		Other				√				√	
6	Environmental Permits	Introduction/increase of environment charges through permit systems and economic instruments		√			√				
7		Introduction/increase of environmental funding through permit systems and economic instruments		√						√	
8		Large Combustion Plant Permits and National Plans going beyond BAT		√			√				
9		Measures to reduce pollution through IPPC Permits going beyond BAT		√			√				
10		Other measure through permit systems and economic instruments: Stacks - height increase; efflux velocity increase; efflux temperature increase			√		√				x
11		Other measure through permit systems and economic instruments: Upgrading existing processes	√				√				x
12		Tradable permit system through permit systems and economic instruments		√			√				
13		Other				√				√	
14	Freight and Delivery Management	Delivery and Service plans				√	√				
15		Freight Consolidation Centre				√	√				
16		Freight Partnerships for city centre deliveries				√	√				
17		Quiet & out of hours delivery				√				√	
18		Route Management Plans/ Strategic routing strategy for HGV's: Lorry bans (total or timed)	√				√				x
19		Other: Transfer of freight to rail	√			√	√				x
20	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance				√				√	

Proceedings of the Institute of Acoustics

21		Low Emissions Strategy				√	√				
22		Other policy: Stricter development controls	√					√			x
23		Other policy: "Buffer" zones	√				√				x
24		Other policy: Heavy/light industry zones	√						√		x
25		Other policy: Relocation	√				√				x
26		Other policy: Property insulation grant scheme	√					√			x
27		Other Policy: Local Bypasses	√				√				x
28		Other Policy: Siting new roads away from properties	√				√				x
29		Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality					√			√	
30		Sustainable Procurement Guidance					√			√	
31	Promoting Low Emission Plant	Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources: Adoption of new clean technologies					√	√			x
32		Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources: Emission abatement techniques	√					√			x
33		Low Emission Fuels for stationary and mobile sources in Public Procurement					√			√	
34		Other measure for low emission fuels for stationary and mobile sources: Improve process technology	√					√			x
35		Public Procurement of stationary combustion sources					√			√	
36		Regulations for fuel quality for low emission fuels for stationary and mobile sources					√			√	
37		Shift to installations using low emission fuels for stationary and mobile sources: Adoption of clean fuels		√				√			x
38		Other Policy					√			√	
39	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	√					√			
40		Low Emission Zone (LEZ) or Clean Air Zone (CAZ)		√				√			x
41		Priority parking for LEV's	√					√			
42		Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging: Alternative fuels and improved vehicle technologies	√					√			x
43		Public Vehicle Procurement - Prioritising uptake of low emission vehicles	√					√			
44		Taxi emission incentives					√	√			
45		Taxi Licensing conditions					√			√	
46		Other: Replace diesel with electric engines	√	√				√			x
47	Promoting Travel	Encourage / Facilitate home-working	√					√			

Proceedings of the Institute of Acoustics

	Alternatives										
48		Intensive active travel campaign & infrastructure	√				√				
49		Personalised Travel Planning				√				√	
50		Promote use of rail and inland waterways									
51		Promotion of cycling	√				√				
52		Promotion of walking	√				√				
53		School Travel Plans				√				√	
54		Workplace Travel Planning: Green commuter plans	√				√				x
55		Other				√				√	
56	Public Information	Via leaflets				√				√	
57		Via other mechanisms				√				√	
58		Via radio				√				√	
59		Via television				√				√	
60		Via the Internet				√				√	
61		Other				√				√	
62	Traffic Management	Anti-idling enforcement	√				√				
63		Emission based parking or permit charges: Work place parking charges resulting in lower traffic flows		√			√				x
64		Reduction of speed limits, 20mph zones: Speed decrease from 50 to 32 km/hr	√							√	x
65		Reduction of speed limits, 20mph zones: Home zones	√				√				x
66		Reduction of speed limits, 20mph zones: Speed limit zones	√					√			x
67		Road User Charging (RUC)/ Congestion charging: Road pricing resulting in lower traffic flows	√				√				x
68		Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane: Bus Priority Lanes					√			√	x
69		Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane: High occupancy vehicle lanes					√			√	x
70		Testing Vehicle Emissions: Roadside emission testing - Noise & AQ	√				√				x
71		Testing Vehicle Emissions: Stricter MOT Tests	√				√				x
72		UTC, Congestion management, traffic reduction: Ramp metering				√	√				x
73		UTC, Congestion management, traffic reduction: Road closure/restrictions	√				√				x
74		UTC, Congestion management, traffic reduction				√	√				x
75		Workplace Parking Levy, Parking Enforcement on highway				√	√				
76		Other: Pedestrianisation	√				√				x
77		Other: Road tunnels	√				√				x
78		Other: Road tables				√		√			x

Proceedings of the Institute of Acoustics

79		Other: Speed limit zones	√					√				x
80		Other: Speed increase from 50 to 60-80 km/hr			√		√					x
81	Transport Planning and Infrastructure	Bus route improvements				√					√	
82		Cycle network		√			√					x
83		Public cycle hire scheme	√				√					
84		Public transport improvements-interchanges stations and services: More local stations				√	√					x
85		Public transport improvements-interchanges stations and services: Bus shelter "enclosures"	√					√				x
86		Other: Accessibility to transport infrastructure	√								√	x
87		Other: Metros or light transit system				√					√	x
88	Vehicle Fleet Efficiency	Driver training and ECO driving aids				√					√	
89		Fleet efficiency and recognition schemes				√	√					
90		Promoting Low Emission Public Transport: Alternative fuels and improved vehicle technologies	√				√					x
91		Testing Vehicle Emissions		√							√	
92		Vehicle Retrofitting programmes		√			√					
93		Other				√					√	
94	Other	Other: Property Insulation grant schemes	√					√				x
95		Other: Building layout/orientation	√					√				x
96		Other: Property Insulation grant schemes	√					√				x
97		Other: Roadside Barriers	√					√				x
98		Other: Mounding	√					√				x
99		Other: Vegetative screens	√	√			√	√				x
100		Other: Quiet surfacings	√					√				x
101		Other: Railside Barriers	√					√				x
102		Other: Train skirts	√					√				x
103		Other: Perimeter/local mounding	√					√				x
104		Other: Use of "self-screening" factory buildings	√								√	x
105	Improving AQ (and Noise) modelling and assessment	Improving modelling predictions	√				√					
106		Tools to assess traffic management schemes prior to implementation	√				√					
107		Tools to evaluate measures to reduce traffic emissions	√				√					
108		Investigating specific measures and issues to understand their air quality impact	√				√					

3.3 Summary of Measures Review Findings

The 2001 Report set out 25 Road traffic related measures, 10 Railway related measures and 14 Industry related measures – 49 in total. The alignment of the original 49 measures with the EU AQ measures classification does not follow a simple 1 to 1 relationship. Several of the 2001 measures aligned with more than one of the EU AQ measures.

One of the 2001 measures relating to industry, 'Reduced Activity' was not included on the grounds that it was felt that it did not align with current Government industrial growth policy.

Eleven of the 2001 measures related strongly to typical noise mitigation measures and so did align closely with the EU AQ measures. They were however retained and included within the 'Other' category. They included such measures as noise compensation schemes, property insulation, barriers and screening.

In total 55 of the EU AQ measures aligned well with original 2001 list of measures. The strongest correlations occurred in categories focused on traditional engineering solutions such as Traffic Management, Transport Planning and Infrastructure and Policy Guidance and Development Control. There was a weaker correlation for 'soft' measures such as those related to promotional activity seeking to encourage behavior change, e.g. Public Information. This perhaps is reflective of the evolving approach to action planning, in particular in air quality, since the 2001 Report.

A review of the original 2001 measure ratings found that they were still broadly applicable. The application of ratings to any form of theoretical measure is always risky and in truth the ultimate test of whether a measure delivers a positive or negative effect, or delivers a synergy or conflict between air quality and noise, will ultimately depend on the specific details of the scheme and the quality of the design and implementation.

However, with consideration of the underlying nature of the benefit particular measures can deliver along with consideration of any associated assumptions as set out in the 2001 Report, it was decided that the original ratings assigned to the 2001 measures could still be viewed as valid and therefore remain unchanged.

For the EU AQ measures that did not receive a rating by virtue of them not aligning with the 2001 Report, new ratings were set out. This was based on professional judgement along with a review of the scheme assumptions and examples set out in Annex A of LAQM (TG16). Due to their existence in an EU list of air quality measures, it was unsurprising that the air quality measures were rated as having the potential to deliver a positive benefit or to be scheme specific. As to what level of synergy or conflict might be delivered relative to noise; it was often viewed that the outcome would be scheme specific, however some measures were felt able to also deliver a positive noise benefit. Some measures were also viewed as having a neutral benefit to noise. This was typically the case with measures targeting emissions, e.g. emission spot checks on vehicles.

4 CONCLUSIONS AND RECOMMENDATIONS

The 2001 Report was drafted shortly after the introduction of the LAQM regime and in advance of the transposition of END. The eventual transposition of END followed a different approach to that expected at the time of the 2001 Report. There were several reasons for this deviation, however as a result of the different implementation approaches and different initial drivers, action planning for noise and air quality, including the underlying modelling and assessments, has been largely developed in separate streams of work.

With the increasing policy focus on public health and wellbeing a new policy context provides a driver for integrating noise and air quality action planning. The wider potential benefits of increased

efficiency in decision making and increasing availability of detailed data and advances in technical assessment methods and knowledge also serves to support this approach.

A formal classification scheme of air quality action planning measures was identified. Originating from the EU, this classification scheme is reproduced in current England LAQM reporting templates and is set out in further detail in the recently published LAQM TG16, where an additional class relating to modelling and assessment is included along with estimated levels of benefit and examples of schemes.

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 list of relevant 2001 Report measures were integrated with the current EU AQ measures to produce a resultant list of 108 measures. Noise and air quality action planning ratings for were reviewed for the 2001 Report measures and developed for those measures which were not previously included in the 2001 Report.

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. It should however be noted that in order to achieve significant change, 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.

There are several recommendations which emerge from this project including:

- It is recommended that further work be undertaken to investigate joint technical assessments for action planning, including the configuration of input data, modelling methodology (e.g. 3D design) and joint modelling exposure assessment.
- It is recommended that future model design harnesses the potential of modern datasets and is based around a scalable approach, enabling local detail to be scaled to a regional/national level. This will require formal standards.
- It is recommended that the timing of future noise and air quality action plan assessments and reporting be aligned to enable joint assessment and reporting. The current annual cycle for AQ reporting, works well with managing updates to data and licensing and helps to maintain a currency to work, and
- It is recommended that 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 END.

5 REFERENCES

1. WS Atkins, "Determination of the Potential Synergies and Conflicts Between Noise and Air Quality Action Plans". DETR. (March 2001).
2. Directive 2002/49/EC of the European 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>
3. The Environment Act. 1995. <https://www.legislation.gov.uk/ukpga/1995/25/contents>
4. The Environment (Northern Ireland) Order 2002. <http://www.legislation.gov.uk/nisi/2002/3153/contents/made>
5. Defra, Local Air Quality Management Technical Guidance (TG16), (February 2018). <https://laqm.defra.gov.uk/technical-guidance/>
6. Greater London Authority, London Local Air Quality Management (LLAQM) Technical Guidance (2016).

- 7 https://www.london.gov.uk/sites/default/.../laqm_technical_guidance_laqm.tg_16.pdf
Defra, Annual Status Report (ASR) Template for England (Excluding London).
<https://laqm.defra.gov.uk/review-and-assessment/report-templates.html>
- 8 Defra (formerly DETR), Our Countryside - The Future - A Fair Deal for Rural England
(November 2000).
- 9 Welsh Government, Well-being of Future Generations (Wales) Act 2015 – The Essentials.
(2015). <http://gov.wales/docs/dsjlg/publications/150623-guide-to-the-fg-act-en.pdf>
- 10 Welsh Government, Local air quality management in Wales – Policy guidance. (June 2017).
<http://gov.wales/docs/desh/publications/170614-policy-guidance-en.pdf>
- 11 Greater London Authority, Draft London Environment Strategy (2017).
<https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/draft-london-environment-strategy>
- 12 European Commission, REFIT Evaluation of the Directive 2002/49/EC (2017).
http://ec.europa.eu/environment/noise/evaluation_en.htm
- 13 Dept. of Health and Social Care, Chief Medical Officer annual report 2017: health impacts
of all pollution – what do we know? (2018).
<https://www.gov.uk/government/publications/chief-medical-officer-annual-report-2017-health-impacts-of-all-pollution-what-do-we-know>