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Valuing transport noise impacts in public urban spaces in the UK: Gaps, opportunities and challenges

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ABSTRACT

Transport noise is the dominant noise source in urban areas. In the UK, its impacts on people at their residential locations are included in project Business Cases, and guidance and analysis tools were developed for valuing the impacts through an impact pathway approach. However, for transport noise impacts on people in public urban spaces, e.g., urban streets, squares and parks, there is still a lack of national methodology. This paper will discuss the gaps, opportunities and challenges in developing a national methodology for valuing transport noise impacts in public urban spaces in the UK. Currently, evidence is lacking on how people are affected by transport noise at non-residential locations, and the values they place on sound environment quality at these locations. However, opportunities are emerging, with recent progress and transitions in urban sound environment research, and increasing attention to the urban realm in (UK) transport policy. The associated challenges, demonstrated with a case study project, may include: obtaining large and consistent data to estimate impact pathways, dose-response relationships and willingness-to-pay; estimation of affected receptors that are spatially and temporally dynamic; and noise modelling for the complex urban environment.

Keywords: Transport noise, Public urban space, Impact appraisal
I-INCE Classification of Subject Number: 67, 60

1. INTRODUCTION

Public urban spaces, including urban streets, squares, parks, etc., are important assets in cities worldwide. They can be places where people meet up, where social and economic exchanges occur, a venue for eating and drinking, for culture, and a place for other activities including forms of exercise, play and rest. It has been argued that good public urban spaces should be sociable, accessible, comfortable, and support diverse uses and activities [1]. The quality of these spaces plays an important role in forming people's impression of a city.

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Sound, together with other physical and biological features, contributes to the quality of public urban spaces, and influences people's experience in these places [2]. Unwanted sound such as transport noise, which is dominant in urban areas, can degrade the quality of public urban spaces [3], and thus potentially reduce the social, economic and health benefits that people obtain from them, and may deter people from using them when use is an option rather than a necessity.

Economic appraisal methods are widely used to analyse changes in transport networks from a welfare economics perspective [4]. The impact of transport noise in public urban spaces is currently not very well covered in transport appraisal, however, not just in the UK but worldwide. This has implications for the ability of appraisals to capture the full benefit of noise reduction strategies in urban areas, or to capture the unintended consequences of strategies which act to increase road traffic noise exposure. WebTAG, the UK guidance on transport appraisal, includes valuation of noise changes experienced at home (residential locations), but for noise impacts at non-residential locations there is no valuation [5]. [6] found the same was true across European countries for which data was available.

The underlying noise assessment procedures in the UK do cover non-residential locations, which presents an opportunity to review those procedures and understand whether they provide a suitable basis for a valuation and appraisal methodology. The wider context for this is the growing international evidence base and literature on the urban sound environment, which has not yet been directly applied to valuation of noise impacts in public urban spaces.

This paper will discuss the gaps, opportunities and challenges in developing a national methodology for valuing transport noise impacts in public urban spaces in the UK. Section 2 gives an overview of relevant aspects of noise impact appraisal in the transport sector. Section 3 identifies some critical gaps in the current evidence base, and in guidance and practice. Section 4 highlights key opportunities emerging from recent acoustic research and from research into place quality or 'urban realm'. Section 5 discusses challenges in developing a national methodology that is consistent and robust, yet flexible, transparent and easy to use. A case study example is used to illustrate and help explore the applicability of such a method. Section 6 concludes the paper.

2. AN OVERVIEW OF CURRENT NOISE IMPACT APPRAISAL AND ASSESSMENT

UK noise impact appraisal procedures are set out in WebTAG [5] for transport projects. These share a common set of marginal noise values with other policy areas in the UK [7]. The values are based on an impact pathway approach for sleep disturbance, annoyance and a set of health impacts (heart attack/acute myocardial infarction (AMI), stroke and dementia). The impact on humans is expressed in Disability Adjusted Life Years (DALYs) which are then valued using a standard DALY value of £60,000 (at 2014 prices).

International practice is described by [6, 8, 9]. Key findings are that: most of the surveyed countries do include noise in transport appraisal (following a period of development since the 1990s); a range of methods are used to derive values for changes in noise exposure, including hedonic pricing (HP) using property market data, or choice experiments using stated preference (SP) or contingent valuation (CVM); the values generally show a reasonable level of comparability across countries, with some exceptions (e.g. see [10]); however the values used are based on noise experienced at residential locations – there is generally very little attention given in cost-benefit analysis (CBA) to noise experienced on streets or elsewhere.

It is important to recognise that the noise assessment methods which underpin the appraisal – providing the quantitative and qualitative data on changes in noise due to a project or policy – are not quite so limited in scope. Noise assessment methods in the UK are defined by DMRB Volume 11 [11]. The types of "sensitive receptor" that the guidance advises the analyst to consider, include:

- Dwellings (which are also well covered by valuation);
- Hospitals, schools, community facilities
- Designated areas – which include natural heritage (e.g. AONB, National Park, SAC, SPA, SSSI) and cultural heritage (Scheduled Ancient Monuments)
- Public rights of way.

Other receptors are not listed but are not excluded – e.g. parks, gardens, squares and open spaces. Since streets are public rights of way, they are also – in theory – in scope.

Another useful categorisation of receptors is seen in the Scottish guidance [12], which also considers their level of sensitivity: High sensitivity is for "Receptors where people or operations are particularly susceptible to noise" – e.g. private gardens, quiet outdoor areas used for recreation, hospitals and care homes – whilst Medium sensitivity includes offices and quieter sports grounds (e.g. tennis, golf, bowls), and Low sensitivity includes unoccupied buildings, factories, noisier sports grounds and night clubs. The US guidance goes further, classifying receptors by activity categories, which are then linked to abatement thresholds for road traffic noise exposure [13]. These are based on research, e.g.the 66dB threshold, which applies to parks, playgrounds, and sports fields, is understood to be based on two people standing 3 feet apart being able to hold a conversation (categories B&C) (Table 1). Table 1 effectively provides a set of minimum standards of road traffic noise exposure for different activities. Whilst the standards are a matter of public choice in a given jurisdiction, the idea of such standards is interesting and potentially useful. In the US method, noise exposure on the street itself, including the sidewalks/pavements, is not a key focus.

In European policy, urban Quiet Areas now have a formal status. Different countries have somewhat different standards, however typically a quiet area is defined as an urban public space where the noise level (for the whole or a major part of the space) is ≤55dB (L_{day} or L_{den}). Parks are a typical example. Alongside this, Defra has defined 'Important Areas' where noise exposure is the most severe: there are 1,130 of these in England, and because the definition is based on exposed resident population, they do highlight noisy streets where there are residential uses close to the road, but they fail to highlight noisy streets dominated by non-residential uses [14].

UK noise assessment methods [11] also note the following difficult aspects of urban noise assessment which are relevant to appraisal:

- in urban stop-start conditions and below 60dB,LA10,18h, perceived noise nuisance is more strongly related to the share of Heavy Goods Vehicles than to the usual noise metrics;
- the make-up of ambient noise affects the selection of noise metric – LA10 would be appropriate in an urban area dominated by road traffic noise, LAeq would be more appropriate in a rural setting;

In conclusion, national appraisal methods already address traffic noise, however there is a focus on noise experienced at residential locations. The underlying assessment methods do cover non-residential noise receptors (including parks, recreational areas, garden and yards), and identify activities and receptors of different sensitivities which are of interest in developing a valuation and appraisal methodology – however there remains a lack of focus on the street environment, and for the receptors that are covered there is a lack of the types of outputs needed for valuation and appraisal (i.e. annoyance/nuisance metrics, wellbeing measures or willingness-to-pay (WTP)).

Table 1. Activity categories and thresholds for traffic noise abatement evaluation (US example).

Activity Category	Abatement Threshold, L_{eq}(h),dB(A)	Evaluation Location	Description of Activity Category
A	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66	Exterior	Residential.
C	66	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D	51	Interior	Auditoriums, day care centres, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A, D or F.
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	-	-	

Source: based on Illinois Department of Transportation’s *Highway Traffic Noise Assessment Manual* [13]

3. GAPS

3.1 Evidence on impact pathways and dose-response relationships

Defra’s noise modelling tool [15] contains dose-response functions for each impact pathway, i.e., annoyance, sleep disturbance and health impacts, for road, railway and aviation noise respectively. The evidence base for the modelling tool was built upon studies that mainly focus on noise impact at residential locations [16, 17, 18]. In the wider literature, a great amount of research has been done to explore the dose-response relationships between exposure to transport noise and the proportion of people experiencing a validated measure of physiological and behavioural consequences or increased risks [19, 20, 21, 22, 23, 24], and again the main focus is on residential locations.

Currently, there is not much comparable research of such depth and rigour for noise impact in public urban spaces. While there has been a growing amount of research and surveys on people’s perception, preferences and/or evaluations of sound environment in public urban spaces [25, 26, 27, 28, 29, 30], limitations are that they had either very small sample sizes, or very short questionnaires with limited numbers of questions, or both. So bias and confounding factors cannot be ruled out with confidence. Also, survey methods or questionnaire designs have not been standardised for public urban space, whilst the standardised ISO survey is restricted to residential locations [31] (ISO, 2003). So there is a lack of consistency for meta-analysis. Furthermore, most of these studies do not have a specific interest in transport noise so lack some of the detail in defining and measuring transport noise that is found in the literature for residential locations.

In summary, with the current evidence, it is hard to be clear about what impact pathways should be included and consequently dose-response functions to be used for assessment of transport noise impact in public urban spaces. Moreover, there are no valuation studies using alternative valuation methods such as HP, SP, CVM (see Section 3.2), that can provide useable interim or substitute values, in the absence of a full impact-pathway study relating to noise impact in public urban spaces.

3.2 Evidence for monetary valuation

Most studies on monetary valuation of noise impact have used the revealed preference approach of hedonic house price modelling to analyse how changes in house prices reflect individuals' willingness to pay for lower noise exposure [32, 33, 34]. There has also been a growing interest in applying stated preference methods, e.g., contingent valuation, conjoint analysis and choice experiments, to value noise impact [35].

However, as is the case with dose-response studies, valuation studies have rarely addressed noise impact in public urban spaces. A relevant example is [36], in which economic value of quiet areas in the UK was studied. However, the study found it difficult to separate the benefits of the sound/noise characteristic of quiet areas from their other characteristics, and the methodology proposed has not been applied to public urban spaces in general. [37] valued a range of local environmental quality attributes, including access to Quiet Areas. Whilst this is helpful for understanding the welfare impact of Quiet Areas, it does not answer the question about valuation of changes in noise exposure in Quiet Areas, or in public urban spaces more generally. Streets are, in fact, often rather noisy areas – this is apparent from any urban noise map. The question for streets is how changes in transport/traffic noise affect the outcomes for people using the street – however those outcomes are measured.

Moreover, noise value estimates need to be transferred over time and/or locations for them to be usable for wider applications. Transferability has been addressed for residential values [9] and will have to be addressed for non-residential values once they are derived.

3.3 Valuing transport project impacts in public space settings

Treatment of public urban spaces in transport appraisal typically falls under multiple headings, e.g. in the UK appraisal framework the relevant headings include Townscape, Landscape, Historic Environment , Journey Quality, Security, Noise, Air Quality, Physical Activity, Severance and Accidents. Many of these are currently qualitative or non-monetised. The lack of an integrated, quantitative treatment of improvements in streets, public spaces or the 'urban realm' can be a barrier to effective appraisal. Developments in this field are discussed in Section 4.2.

4. OPPORTUNITIES

4.1 Transitions in urban sound environment research

While we address transport noise specifically, the general urban sound environment research is still highly relevant, and some recent transitions in the research have brought about new opportunities for developing methods of valuing transport noise impact in public urban spaces.

The growing interest in associations between public health and urban soundscape [38] will help to gain evidence for identification of impact pathways for valuing transport noise impact in public urban spaces. While pleasantness and annoyance ratings have already been widely used in soundscape evaluation studies, which can contribute to the construction of an annoyance pathway, development of health impact pathways will make the impact appraisal more compatible with current WebTAG and future transport strategy of promoting public health (See Section 4.2).

The emerging development of crowd sourcing sound environment evaluations [39, 40, 41] has provided the potential to acquire large samples for public space noise surveys at low cost. On the other hand, progress is being made in standardisation in soundscape research and practice. The Soundscape Indices (SSID) project (2018-2023) [42] is working to develop measurable soundscape indices for soundscape prediction, design, and standardisation. And following ISO 12913-1, which defined and established conceptual framework of soundscape [43], ISO 12913-2 to standardise soundscape data collection and reporting requirements is under preparation [44]. Such progress should enable dose-response analysis of transport noise impact in public urban spaces using richer and more consistent data in the future.

4.2 Increasing attention to the urban realm in (UK) transport policy

Over the last 10 years there has been increasing attention to the urban realm by researchers and policymakers in the UK. This has come from both a planning perspective [45] and an appraisal/valuation perspective [46, 47, 48]. Urban realm refers to all the space that is publicly accessible between the buildings in an urban environment, hence urban realm is – essentially – synonymous with public urban space. Measuring and valuing the impact of improvements in the urban realm will contribute to the business case for redesigning streets, squares, junctions, transport hubs and other parts of the urban fabric.

Appraisal research has so far tackled the question: what aspects and attributes of the urban realm matter to people who use it – evidenced by their satisfaction, rating responses, willingness-to-pay, preferences in choice experiments, and other metrics. A summary of the aspects and attributes that appear to matter to people is as follows:

- sound environment – various sources including traffic & transport noise, human speech, and natural elements such as street trees and birdsong;
- air quality;
- safety / threat of collision;
- personal security – in relation to crime;
- accessibility / barriers to movement – on a very localised spatial scale, how permeable is the urban environment in all directions – including severance across roads and railway infrastructure – and including pedestrian congestion;
- visual amenity and character – influenced by built and natural heritage, for example;
- other ecosystem services – e.g. the shading and shelter provided by street trees;
- facilities – including for sitting/resting, exercise/play/recreation, drinking and eating, retail (e.g. markets and pop-ups), outdoor culture, and so on.

The way that these attributes combine to influence people's wellbeing is of central interest to researchers. People's experience of noise, and sound generally, can be conceptualised as part of their overall experience of the urban realm/public urban space. For a conceptual framework that would link to appraisal :

- people are the receptors – in an appraisal the benefits will be built from their welfare changes, and so the analysis needs to go beyond the current treatment of receptors in noise assessment to address (and quantify) the numbers of people exposed;

- there is evidence that the impact of traffic noise (on annoyance/stress/wellbeing/health) depends on the activity a person is trying to engage in; in addition, the time spent in each activity may be relevant, as in travel time analysis, and the urban realm attributes may interact in the wellbeing function so that marginal value of noise depends on the levels of other attributes (e.g. noise changes may be insignificant if the space is also unsafe; and feelings of 'tranquillity' may depend not only on quiet);
- as with other appraisal components, it will be necessary to aggregate across people & places in the appraisal, and across times of the day/week/year – some that is conceptually straightforward, but empirically there is a long way to go.

The UK Department for Transport (DfT), who are responsible for the development of national guidance and analysis tools for transport project appraisal, is updating the appraisal guidance, and have emphasized the impacts of transport projects on location attractiveness, place quality, urban realm and public health in their new strategy [48]. Whilst location attractiveness goes beyond the urban realm attributes discussed in this section (to include agglomeration for example), the quality of the urban realm is certainly central to the understanding of place quality and location attractiveness, and noise is an integral part of that.

5. CHALLENGES DEMONSTRATED BY A CASE STUDY APPLICATION

Otley Market Place pedestrianisation scheme is used as a case study project in this section to discuss possible challenges in developing and applying a national methodology for appraisal of noise impacts in public urban spaces.

5.1 Otley Market Place pedestrianisation scheme and its noise impact appraisal using WebTAG

Otley is a town of 14,000 people in West Yorkshire, England. The town centre is large enough to have a main street network rather than just one main thoroughfare. Key streets for activities and traffic are: Kirkgate, Market Place/Boroughgate and Bondgate (Figure 1). A pedestrianisation scheme on Market Place (between Kirkgate and Crossgate) could be attractive, and local traffic would be able to use the remaining network to pass through the town.

Following WebTAG, the appraisal of noise impact of the scheme would include:

- scoping,
- calculation of with and without scheme noise levels,
- estimation of the affected population,
- monetary valuation of noise impacts.

For scoping, the scheme would cause a significant change in traffic flow and there are sensitive receptors (residential properties) along the street that would be subject to noise changes greater than the threshold levels (1 dB LA10,18h short term, 3 dB LA10,18h long term), so it is clearly evident that a detailed appraisal would be needed, and night time noise should be included. Calculation of with- and without-scheme noise levels would be carried out as part of the environmental assessment. In the UK, Calculation of Road Traffic Noise (Department of Transport, 1988) is normally used for the calculation. Here, as it is only for demonstration, we used Defra 2012 strategic noise mapping [49] for without-scheme noise level (Figure 2), and estimated noise level changes with-scheme at each residential property with reasonable assumptions (Table 2). Affected population would be estimated by household count. The assumed household locations and numbers for this hypothetical project are shown in Figure 2 and Table 2.

Using noise level change at each household as input, monetary value of the noise impact would be calculated using Defra's noise modelling tool [15]. Result for this case project is shown in Table 2. Since there is only a small number of residential properties, the estimated benefit of noise reduction from the predestrianisation scheme is not high.

Figure 1. The town centre of Otley, West Yorkshire, England, and the key streets for activities and traffic (reproduced based on Ordnance Survey MasterMap).

5.2 Possible challenges in appraising noise impact on street

5.2.1 Challenges in scoping

Bringing the appraisal in line with the scope of the noise impact assessments already undertaken (Section 2) would be a useful starting point – this means widening the set of receptors. Then a challenge is to carefully add the missing receptor types: including people on streets, engaging in activities such as walking/running/cycling, stopping to converse with others, resting, eating and drinking, window shopping/outdoor shopping, play, etc (Figure 2). The challenges with this may be more empirical than conceptual (see Section 5.2.3 and 5.2.4).

5.2.2 Challenges in calculation of noise levels

Traffic on Otley Market Place often does not flow freely, which is more likely to be the case for streets adjacent to or used as public urban spaces than streets/roads at typical residential areas. Such traffic flow patterns are not well captured by current mainstream road noise calculation models, particularly not by the UK standard model CRTN which treats traffic as line sources with constant flow [50]. Noise modelling for a complex urban environment is a challenge for the analysis underpinning the appraisal method: this may apply even more to on-street receptors than residential ones, since people on the street may be closer to the traffic or more directly exposed.

Another issue related to noise level calculation is the selection of a suitable noise metric, depending on the level and dominant sources of the background sounds. The pedestrianisation scheme would remove traffic from Market Place and dominant sounds on street are likely to have substantial changes. A noise metric suitable for both the with- and without-scheme scenarios might be a challenge to achieve. Choice of noise metrics should also be guided by the dose-response evidence, yet to be available.

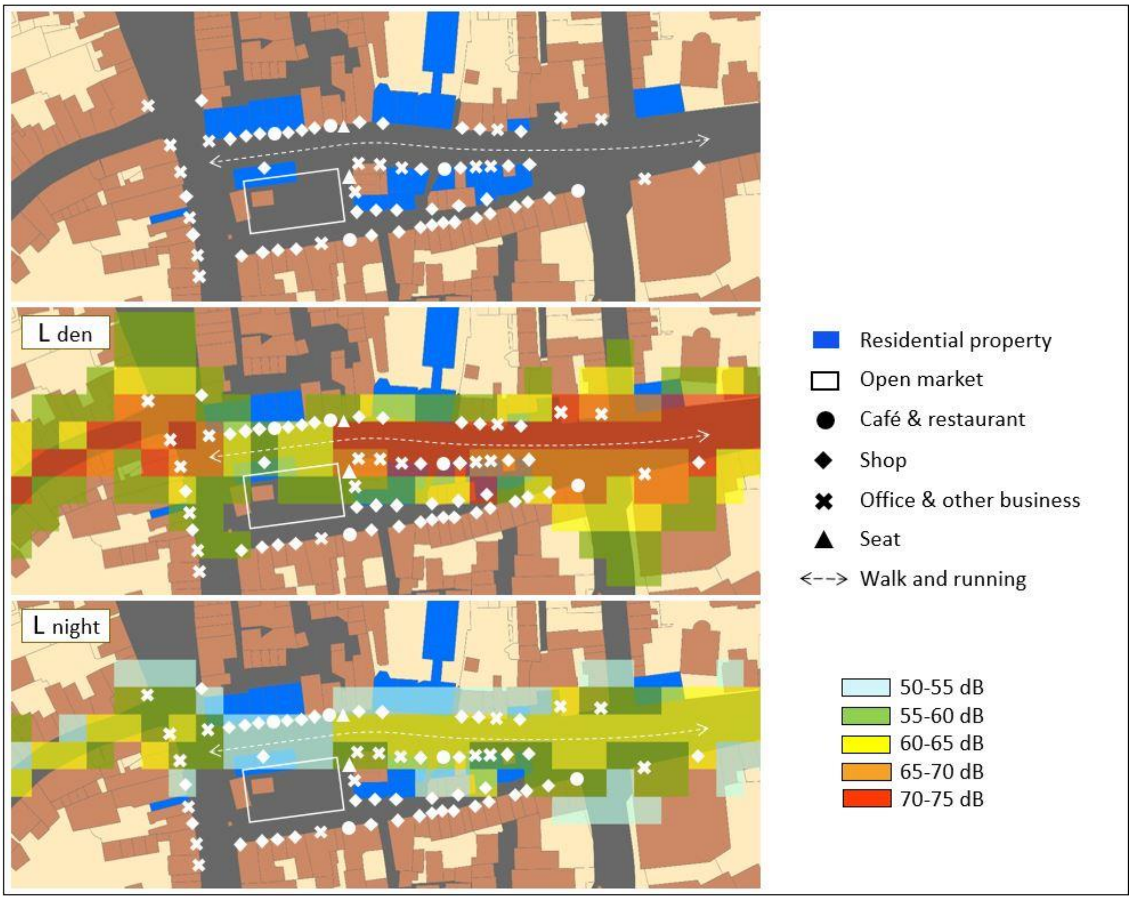

Figure 2. Defra 2012 strategic noise maps for without-scheme noise exposure at residential and non-residential receptors.

Table 2. Residential noise benefits of case study scheme, calculated using Defra's noise modelling tool [15].

Residential Property	No. of household	Noise level change (dB)				Benefit (£ in 2014 price)					
		Lden before	Lden after	Lnight before	Lnight after	Direct AMI	Strokes	Dementia	Sleep disturbance	Annoyance	Total
1	1	62	57	53	48	22	16	24	231	140	432
2	1	57	53	48	44	0	11	16	84	64	175
3	1	57	53	48	44	0	11	16	84	64	175
4	4	60	56	51	47	36	53	80	700	415	1,285
5	1	67	56	58	47	79	32	49	518	331	1,008
6	1	57	52	48	43	0	13	20	84	78	195
7	1	67	56	58	47	79	32	49	518	331	1,008
8	1	67	55	58	46	79	35	53	546	347	1,059
9	1	72	52	63	43	200	59	89	956	691	1,996
10	1	62	52	53	43	22	29	44	315	217	628
11	1	67	55	58	46	79	35	53	546	347	1,059
12	1	57	53	48	44	0	11	16	84	64	175
13	1	67	58	58	49	79	27	41	455	294	895
14	1	60	55	51	46	9	16	24	203	120	372
15	1	56	52	47	43	0	11	16	54	60	140
16	1	62	51	53	42	22	32	48	315	230	647
17	2	58	52	49	43	0	32	48	234	194	507
18	3	70	60	61	51	431	90	135	1,769	1,243	3,668
19	2	62	57	53	48	43	32	48	462	279	865
20	1	72	52	63	43	200	59	89	956	691	1,996
21	1	57	52	48	43	0	13	20	84	78	195
22	1	72	57	63	48	200	46	69	872	613	1,801
23	1	67	58	58	49	79	27	41	455	294	895
Total	30	-	-	-	-	1,655	721	1,088	10,525	7,186	21,175

5.2.3 Challenges in estimation of affected population

Unlike static residential properties that can be easily counted to estimate number of receptors in current noise impact appraisal for residential locations, receptors in public urban spaces are dynamic spatially and temporally, making numerical estimation more difficult. In the case study project, Figure 2 indicates potential receptors of different types that would be affected by noise changes from the pedestrianisation scheme. Since the scheme only covers a small area, counting pedestrians and other users, ideally on different days and times, in the without-scheme scenario might be an option for estimation of affected population. The more challenging part comes in the with-scheme scenario. While in most cases the number of residential properties are unlikely to change after scheme implementation, the number of receptors on street would be expected to change after schemes such as pedestrianisation. Methods used to estimate future pedestrians and other users may significantly affect the estimated benefit-cost ratio of the scheme.

Moreover, people on the Market Place would be in various activities (e.g., walking, shopping, talking in a street café) and thus have different exposure durations at different times. Aggregating noise impacts over them in a methodical and balanced manner would be another challenge.

5.2.4 Challenges in monetary valuation of noise impacts

Currently there is no tool to generate benefit results for public urban spaces, equivalent to Table 2 for residential locations. As pointed out in Section 3, there are still gaps in the evidence of impact pathways, dose-response relationships and WTP for noise impact in public urban spaces, which are necessary for construction of a monetary valuation tool. The sensitivities and thresholds of the receptors (i.e. people engaged in different activities in different locations with different ambient sounds) have yet to be established. Despite the opportunities identified in Section 4.1, standardised exposure and response measures and data collection for noise impact in public urban spaces will themselves require substantial research inputs, and new large-sample noise surveys.

There will also be more challenges in tool design and application, as the level and source of background sounds in public urban spaces is heterogeneous, and aggregation will require more steps because of this. Finally, when WTP is being measured using HP,SP or CVM, the correlations between noise, air pollution and severance (via traffic) are a concern – the impact pathway approach is appealing in unpacking the effect of noise alone, but is probably more time-consuming in delivering results.

For the time being it is not possible to conduct monetary valuation of noise impact on street for the Otley pedestrianisation scheme with a reasonable level of confidence. An adjusted value of annoyance impact for residential locations might be considered as an interim option, however the problem with all such rules of thumb is a lack of robustness, which limits their contribution to a high quality economic appraisal of the project.

6. CONCLUSIONS

This paper has discussed gaps, opportunities and challenges in developing a national methodology for valuing transport noise impacts in public urban spaces in the UK, which are currently not very well covered in transport appraisal.

Critical gaps identified include evidence on impact pathways and dose-response relationships and evidence for monetary valuation. The existing literature focuses primarily on noise impact at residential locations. The available urban soundscape literature might have some implications for impact pathways and dose-response relationships, however, the data has limitations of sample size and consistency, and lacks a specific focus on transport noise.

Key opportunities are emerging from recent transitions in urban sound environment research and from increasing attention to the urban realm in (UK) transport policy. The growing interest in associations between public health and urban soundscape will help to produce evidence for identification of impact pathways. The development of crowd sourcing sound environment evaluations and progress in standardisation in soundscape research and practice will enable dose-response analysis using richer and more consistent data in the future. On the other hand, increasing attention to the urban realm by researchers and policymakers in the UK is helping to structure the question about the value of traffic noise changes in the urban environment, recognising interdependencies with other place quality attributes and different uses of the urban realm. The answer will require insights and inputs from several disciplines, and progress is being encouraged from both a planning perspective and an appraisal/valuation perspective.

The paper also identified some substantial challenges including capturing the heterogeneity of the urban sound environment, the complex mix of activities and types of space, and the quantification of human exposure in a dynamic setting. Recent research has begun to tackle these challenges, but there remains a need for further work in all these areas.

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