



1. Home (<https://www.gov.uk/>)
2. Environment (<https://www.gov.uk/environment>)

Guidance

Noise pollution: economic analysis

This guide explains how impacts on noise should be incorporated into a cost benefit analysis.

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Contents

- Overview
- Economic valuation tools
- Detailed assessment of noise impacts
- Publications
- Noise Modelling Tool
- Further information

Overview

Noise can have an effect on health, wellbeing, productivity and the natural environment. The government's policy on noise is set out in the Noise policy statement for England (<https://www.gov.uk/government/publications/noise-policy-statement-for-england>).

It's estimated that the annual social cost of urban road noise in England is £7 to 10 billion. This places it at a similar magnitude to road accidents (£9 billion) and significantly greater than the impact on climate change (£1 to 4 billion). A report published by the World Health Organisation (WHO) in March 2011 identified environmental noise as the second largest environmental health risk in Western Europe.

It is important that the impacts on noise are fully considered in decision making for any policy, programme or project.

The approach to use for valuing noise impacts will depend upon the decision being made. Economic valuation tools should be used for initial screening or decisions with a small impact on noise. Detailed analysis is required where the noise impacts may be substantial or have a large effect on the decision.

Economic valuation tools

Tools have been developed which convert changes in noise exposure to estimated monetary values, to support the assessment of the effects of environmental noise. The central estimates of values for road, rail and aircraft exposure are presented in Table 1 and Table 2. A range of sensitivities are available around these values from the Noise Modelling Tool.

The tables show an estimated value that corresponds to a change in the noise level. These values may not be suitable to use if:

- a decision is likely to have a substantial effect on noise
- the change in noise levels is going to affect the outcome of a decision

In these cases, a more detailed assessment may be justified.

Table 1: Total road, rail and aircraft noise marginal values, £ per household per dB change, Central Values, 2014 prices

| Change in noise metric by decibel (dBA) (daytime noise metric) | | Total Road (including sleep disturbance) | Total Rail (excluding sleep disturbance) | Total Aircraft (excluding sleep disturbance) |
|---|------|--|--|--|
| 45.0 | 46.0 | £11.28 | £3.90 | £15.61 |
| 46.0 | 47.0 | £11.23 | £3.95 | £17.72 |
| 47.0 | 48.0 | £11.31 | £4.11 | £19.82 |
| 48.0 | 49.0 | £11.52 | £4.40 | £21.90 |
| 49.0 | 50.0 | £18.41 | £4.80 | £23.96 |
| 50.0 | 51.0 | £18.89 | £12.46 | £38.71 |
| 51.0 | 52.0 | £19.49 | £13.13 | £40.80 |
| 52.0 | 53.0 | £20.23 | £13.91 | £42.88 |
| 53.0 | 54.0 | £21.09 | £14.81 | £44.94 |
| 54.0 | 55.0 | £47.78 | £15.84 | £46.98 |
| 55.0 | 56.0 | £51.22 | £16.98 | £49.01 |
| 56.0 | 57.0 | £54.79 | £18.24 | £51.02 |
| 57.0 | 58.0 | £58.49 | £19.62 | £53.02 |
| 58.0 | 59.0 | £63.86 | £22.68 | £56.56 |
| 59.0 | 60.0 | £69.33 | £25.82 | £60.05 |
| 60.0 | 61.0 | £74.69 | £28.85 | £63.29 |
| 61.0 | 62.0 | £80.21 | £32.03 | £66.54 |
| 62.0 | 63.0 | £85.90 | £35.37 | £69.83 |
| | | | | |

| | | | | |
|------|------|---------|---------|---------|
| 63.0 | 64.0 | £91.75 | £38.87 | £73.14 |
| 64.0 | 65.0 | £97.78 | £42.53 | £76.47 |
| 65.0 | 66.0 | £103.96 | £46.34 | £79.82 |
| 66.0 | 67.0 | £110.32 | £50.32 | £83.21 |
| 67.0 | 68.0 | £116.85 | £54.46 | £86.61 |
| 68.0 | 69.0 | £123.54 | £58.76 | £90.04 |
| 69.0 | 70.0 | £130.39 | £63.22 | £93.50 |
| 70.0 | 71.0 | £137.42 | £67.83 | £96.98 |
| 71.0 | 72.0 | £144.61 | £72.61 | £100.48 |
| 72.0 | 73.0 | £151.97 | £77.54 | £104.01 |
| 73.0 | 74.0 | £159.49 | £82.64 | £107.57 |
| 74.0 | 75.0 | £167.18 | £87.89 | £111.15 |
| 75.0 | 76.0 | £175.04 | £93.31 | £114.75 |
| 76.0 | 77.0 | £183.07 | £95.22 | £116.66 |
| 77.0 | 78.0 | £188.93 | £97.17 | £118.62 |
| 78.0 | 79.0 | £190.93 | £99.16 | £120.61 |
| 79.0 | 80.0 | £192.96 | £101.20 | £122.64 |
| 80.0 | 81.0 | £195.03 | £103.27 | £124.71 |

Notes:

1. There are no relationships available between the different noise indicators for rail and aircraft noise. If detailed data are not available for the specific indicator of interest, the available results for the daytime indicator can be used as an approximation for the other required indicator (e.g. assume Lden = LAeq,16h). This type of approach cannot be used for night noise.
2. Sleep disturbance has been excluded for rail and aircraft but included for road in the table above. For road where Lnight is not available the daytime metric can be transformed into Lnight. However this relationship is not applicable for rail and aircraft. Sleep disturbance is presented separately in Table 2 against Lnight.

Table 2: Sleep disturbance night time noise marginal values £ per household per dB change, Central Values, 2014 prices

| Change in Lnight noise metric by decibel dB(A) | | Road | Rail | Aircraft |
|--|----|--------|--------|----------|
| 45 | 46 | £29.20 | £13.59 | £37.93 |
| 46 | 47 | £32.07 | £15.06 | £40.79 |
| 47 | 48 | £34.94 | £16.52 | £43.65 |
| 48 | 49 | £37.81 | £17.99 | £46.52 |
| 49 | 50 | £40.68 | £19.46 | £49.38 |
| 50 | 51 | £43.55 | £20.92 | £52.24 |
| 51 | 52 | £46.42 | £22.39 | £55.11 |
| 52 | 53 | £49.29 | £23.86 | £57.97 |
| 53 | 54 | £52.17 | £25.32 | £60.83 |
| 54 | 55 | £55.04 | £26.79 | £63.70 |
| 55 | 56 | £57.91 | £28.25 | £66.56 |
| 56 | 57 | £60.78 | £29.72 | £69.42 |
| 57 | 58 | £63.65 | £31.19 | £72.29 |
| 58 | 59 | £66.52 | £32.65 | £75.15 |
| 59 | 60 | £69.39 | £34.12 | £78.01 |
| 60 | 61 | £72.26 | £35.59 | £80.88 |
| 61 | 62 | £75.13 | £37.05 | £83.74 |
| 62 | 63 | £78.00 | £38.52 | £86.60 |
| 63 | 64 | £80.88 | £39.99 | £89.47 |
| 64 | 65 | £83.75 | £41.45 | £92.33 |
| 65 | 66 | £86.62 | £42.92 | £95.19 |
| 66 | 67 | £86.62 | £42.92 | £95.19 |
| 67 | 68 | £86.62 | £42.92 | £95.19 |
| 68 | 69 | £86.62 | £42.92 | £95.19 |
| 69 | 70 | £86.62 | £42.92 | £95.19 |

| | | | | |
|----|----|--------|--------|--------|
| 70 | 71 | £86.62 | £42.92 | £95.19 |
| 71 | 72 | £86.62 | £42.92 | £95.19 |
| 72 | 73 | £86.62 | £42.92 | £95.19 |
| 73 | 74 | £86.62 | £42.92 | £95.19 |
| 74 | 75 | £86.62 | £42.92 | £95.19 |
| 75 | 76 | £86.62 | £42.92 | £95.19 |
| 76 | 77 | £86.62 | £42.92 | £95.19 |
| 77 | 78 | £86.62 | £42.92 | £95.19 |
| 78 | 79 | £86.62 | £42.92 | £95.19 |
| 79 | 80 | £86.62 | £42.92 | £95.19 |
| 80 | 81 | £86.62 | £42.92 | £95.19 |

Detailed assessment of noise impacts

Where the effect of noise is likely to be substantial or a decisive factor for a proposal, a detailed assessment may be justified. The scale of the assessment depends upon the characteristics of the decision. It is therefore not possible to provide a specific method that can be used in all situations.

To discuss the best approach to assess the impacts of noise, it is recommended that you contact IGCB@defra.gov.uk. To inform these discussions please have the following information available:

- background on the decision being made
- an outline of the proposal and different options being assessed
- the indicative noise assessment undertaken
- timing of the analysis to feed into the decision
- quantitative estimates of the other impacts of the decision

The appropriate evidence will depend on a range of factors. The potential areas for consideration can be broadly separated into four groups:

1. Amenity - the conscious displeasure of those exposed to the noise. At present two amenity impacts can be quantified and valued; sleep disturbance and annoyance.
2. Health - noise is associated with a range of effects on health. The three health effects currently valued are heart attacks, strokes and dementia.
3. Productivity - through distraction, fatigue and interrupting communication noise can have a negative impact on productivity. It is not yet possible to assess and value these impacts.
4. Environmental - noise can have a notable impact on the natural environment, for example noise may alter bird breeding patterns, disturb wildlife and damage sensitive ecosystems. At this time these impacts have not been valued. The effects of night noise, school attainment and other factors such as the value

of quiet areas have not been fully quantified. These cannot be included in full appraisal but it may be important to include these in future research.

Publications

- Environmental noise: valuing impacts on sleep disturbance, annoyance, hypertension, productivity and quiet (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/380852/environmental-noise-valuing-impacts-PB14227.pdf) (PDF, 775KB)
- Noise & Health - Valuing the Human Health Impacts of Environmental Noise Exposure (<http://archive.defra.gov.uk/environment/quality/noise/igcb/publications/noisehealthreport.htm>)
- An Economic Valuation of Noise Pollution - developing a tool for policy appraisal (<http://archive.defra.gov.uk/environment/quality/noise/igcb/publications/firstreport.htm>)

Noise Modelling Tool

This Transport noise modelling tool

(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/380849/transport-noise-modelling-tool.xls) (MS Excel Spreadsheet, 6.28MB) calculates the marginal costs associated with increases in transport noise (road, rail, aviation) above baseline values for:

- sleep disturbance
- annoyance
- Acute Myocardial Infarction (AMI commonly referred to as heart attacks)
- hypertension

A Transport noise modelling tool open document format

(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/380850/transport-noise-modelling-tool.ods) (ODS, 1.9MB) version is also available.

Supporting research

- Estimating Dose-Response Relationships between Noise Exposure and Human Health in the UK (<http://webarchive.nationalarchives.gov.uk/20130403165908/http://archive.defra.gov.uk/environment/quality/noise/igcb/publications/healthreport.htm>)
- Webtag Guidance on quantifying the impacts of noise for transport schemes (<https://www.gov.uk/transport-analysis-guidance-webtag>)
- Health Protection Agency (HPA) Report: Environmental Noise and Health in the UK (<http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/noise>)
- WHO (2011) The Environmental Burden of Disease (http://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf)

Further information

- Developing Guidance on the valuation of transport-related noise for inclusion in Webtag (http://webarchive.nationalarchives.gov.uk/20090807133320/http://www.dft.gov.uk/pgr/economics/rdg/birmingham/col_l_guidanceonthevaluationoftra/lopingguidanceonthevalua3048.pdf) (PDF)
- Valuation of transport-related noise in Birmingham (<http://webarchive.nationalarchives.gov.uk/20100203095144/http://dft.gov.uk/pgr/economics/rdg/birmingham/>)
- Attitudes to Noise from Aviation sources in England (ANASE) study (<http://webarchive.nationalarchives.gov.uk/20091203104719/http://www.dft.gov.uk/pgr/aviation/environmentalissues/Anase/>)

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1. 19 December 2014 Replaced table 1 with updated version.
2. 28 November 2014 Updated with new tables using 2014 costs, added a noise modelling tool and Environmental Noise: Valuing impacts on sleep disturbance, annoyance, hypertension, productivity and quiet report.
3. 9 April 2013 First published.

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