

4 Services provided by nature

- 4.1 This section provides evidence about the different services provided by nature. Specific services may be of interest to different policy makers and practitioners, so you may choose to focus just on those. Alternatively, you may be interested in overarching themes such as economic competitiveness, so [Chapter 2](#) and [Chapter 3](#) may be useful in identifying how the environment contributes to those themes.
- 4.2 It is important to note that not all services provided by nature are included here. The ones chosen are the ones which on the basis of current evidence are most important in the context of environmental projects. The ones selected are also those for which we have available scientific and economic evidence.

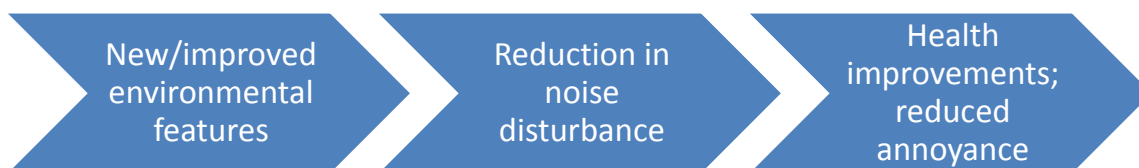
4g Noise

Noise can have ongoing impacts on people's health. In the right context, environmental features can effectively muffle unwanted sounds.

Introduction

- 4.38 This section reviews the evidence that the natural environment can contribute to noise reduction. Noise is defined as 'unwanted sound' and a review of the evidence shows that it interferes in complex task performance, modifies social behavior and causes annoyance. In children, chronic aircraft noise exposure impairs reading comprehension and long-term memory and may be associated with increased blood pressure (Stansfeld and Matheson 2003).
- 4.39 Evidence indicates that exposure to road traffic noise is linked to an increased risk of hypertension, heart disease and heart attack in adults. The WHO estimates that 1.8 percent of all heart attacks in Western Europe can be attributed to road traffic noise, and that more than 1 million healthy life years are lost each year due to traffic-related noise (WHO Regional Office for Europe 2011)⁹⁵.
- 4.40 Tassi, Rohmer et al. (2013) demonstrated that chronic exposure to nocturnal railway noise (average of 39 decibels) is linked to chronic daytime sleepiness, lowered alertness and poor attention to sustained tasks. Study participants had been exposed to the noise for over a decade, on average, and showed no sign of having become accustomed to it (Tassi, Rohmer et al. 2013)⁹⁶.
- 4.41 The World Health Organization guidelines for Europe recommend that people should not be subjected to night-time noise levels greater than 40 decibels (the approximate sound level of a library); in Europe almost 34 million people may be exposed to more than 50 decibels at night (approximate sound level of a conversation at home) (European Environment Agency 2010).
- 4.42 A study of the impact of noise on house prices in Birmingham found that a 1 decibel increase in road traffic noise reduces the selling price of a property by between 0.18 and 0.55 per cent. Over the lifetime of the property, a decrease in noise levels from 56 to 55 decibels would be worth £31.49 per household per year (Day, Bateman et al. 2007)⁹⁷.

Theory of change



⁹⁵ The authors note that these estimates are based on a limited number of studies, and do not account for some other contextual factors that may be correlated with road traffic (for example, air pollution).

⁹⁶ This study compared two similar groups of French residents, 20 of whom had lived for a long time near a railway track, and 20 of whom lived in a comparable, quiet area. This is a relatively small study and results should therefore be treated with some degree of caution.

⁹⁷ These results are specific to the Birmingham property market, and should not be extrapolated to other locations. However they do indicate that noise can impact on property values.

Can the benefit be quantified?

4.43 Yes, with caution. The reduction in noise levels as a result of environmental features can be quantified, however it is highly context dependent. Care needs to be taken in extracting the impact of noise on health from other impacts on health that may occur at the same time due to being in more natural areas.

How strong is the evidence?

4.44 The evidence is strong that the natural environment, particularly vegetation, contributes to noise reductions, and that this has health benefits. However the effect depends on the specific context and location.

Evidence

- The presence of vegetation, and soft rather than hard surfaces, reduces the extent to which sound carries around urban areas (Bolund and Hunhammar 1999). Soft lawns and dense tall vegetation reduce the extent to which sound carries, although sources differ in their quantification of this effect. Lawns reduce noise by reducing reflection of the sound wave, an effect which accounts for the quietness experienced after snowfall. Tall vegetation absorbs lateral short wave-length sound (Barth and Schmid 2001).
- Fang and Ling identify that key factors affecting the noise attenuation provided by tree belts are: visibility (denseness of the trees/foilage), belt width, tree height, and the height of the noise source and receiver. They find that a tree belt 3.6 metres wide, 4 metres high, and with visibility of 2 metres could reduce the sound level by 4 decibels for a noise source/receiver 1.2 metres high and 28 metres away (Fang and Ling 2005)⁹⁸.
- Modelling of green roofs has demonstrated that they can reduce road traffic noise within a house, and the effect is strongest at higher vehicle speeds. In a typical built-up street with heavy traffic, a green roof could reduce sound levels by 8 decibels compared with a rigid roof (Van Renterghem and Botteldooren 2009)⁹⁹.
- Green walls have been demonstrated to provide sound attenuation benefits equivalent to other building materials and furnishings. This effect depends on the type of vegetation and substrate used, and the density of the plantings (Hien Wong, Yong Kwang Tan et al. 2010).
- Courtyards on the quiet side of building can reduce the level of road traffic noise annoyance by providing some quieter outside space. A study in Sweden found that the quality of the courtyard in terms of 'naturalness' and features such as benches and playgrounds *as well as* the noise level had a significant impact in reducing noise annoyance (Gidlöf-Gunnarsson and Öhrström 2010)¹⁰⁰.
- People exhibit strong preference hierarchy with regard to sound exposure, with mechanical sounds liked least, followed by human sounds and with natural sounds preferred. More natural greenspace, particularly with a significant shrub layer, can encourage the production

⁹⁸ This estimate was based on common Taiwanese hedge trees, so may not be directly transferable to the UK situation. Visibility at 2 metres means that a white object held 2 metres within the tree belt could be seen outside the tree belt.

⁹⁹ This assumes a saddle-backed roof with a 30 degree slope, and a single lane road with traffic travelling at a constant 70km/hour.

¹⁰⁰ The study was based on questionnaire responses in four cities areas in Stockholm and Gothenburg. Appropriate controls were put in place with regard to sound levels on the noisy and on the quiet sides of the building, similar types of traffic, similar types of houses, and ensuring that there were no patterned differences to age or country of origin. Courtyard quality was assessed in terms of presence of outdoor furniture, playgrounds for children, presence of flowers in pots or beds and the aspect (very important that far North). At 63 – 68 decibels (the higher level assessed) 42% of residents reported annoyance with low quality courtyards and only 29% with high quality courtyards).

of bird song at the same time as providing habitat for wild bird species (Irvine, Devine-Wright et al. 2009).

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