Environment and health

Environmental noise

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Exposure to environmental noise		Significantly decrease noise pollution – 7th EAP	

Efforts to reduce environmental noise tend to be offset by an increase in the number of people being exposed to high noise levels, in particular due to increasing road and aviation traffic and an increase in the number of city inhabitants

The Seventh Environment Action Programme (7th EAP) includes an objective that noise pollution in the EU should be decreased significantly by 2020, moving closer to World Health Organization (WHO) recommended levels. Exposure to outdoor noise is monitored under the Environmental Noise Directive (END) against two thresholds, an indicator for the day, evening and night periods (L_{den}) that measures 'annoyance' and an indicator for night periods (L_{night}) that is designed to assess sleep disturbance. These thresholds do not correspond directly to the WHO recommended values and currently there is no mechanism in place for tracking progress against these values. Data reported under the Directive suggest that noise remains a major environmental health problem in Europe. In 2012, at least 125 million people, or one in four Europeans, were exposed to daily road traffic noise levels exceeding the assessment threshold specified in the END. During the more sensitive night period, 8 million people suffered sleep disturbance as a result of environmental noise that exceeds the Directive's night-time noise threshold. As a result, at least 10 000 cases of premature death from noise exposure occur each year, with road traffic as the dominant source. Where comparable, reported data suggest that noise exposure levels remained relatively stable between 2007 and 2012. Efforts to reduce the noise from individual sources are being offset by continuing migration to urban areas and increases in vehicular traffic. This is likely to continue in the future, with transport demand set to increase, including road transport, and with predicted increases in aircraft noise. It is therefore unlikely that noise pollution will decrease significantly by 2020.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

Noise exposure from transport sources and industry can lead to annoyance, stress reactions, sleep disturbance, and increases in the risk of hypertension and cardiovascular disease. Environmental noise causes at least 10 000 cases of premature death in Europe each year, with almost 20 million adults suffering annoyance and a further 8 million suffering sleep disturbance (EEA, 2014). The WHO (2011) identified noise as the second most significant environmental cause of ill health, the first being air pollution (AIRS_PO3.1, 2016).[1] The 7th EAP (EU, 2013) includes an objective to significantly decrease noise pollution by 2020, moving closer to WHO recommended levels.

Policy targets and progress

The Environmental Noise Directive (END) is the main EU instrument through which land-based noise emissions are monitored and actions developed. It defines environmental noise as 'unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity' (EU, 2002). It places an obligation on EU Member States to assess noise levels by producing strategic noise maps for all major roads, railways, airports and urban areas. Based on these noise-mapping results, Member States must prepare action plans containing measures that address noise issues and their effects for those areas where the specific END indicators (55 dB averaged across the day, evening and night periods (L_{den}) and 50 dB averaged across the night period (L_{night})) have been surpassed. The Directive neither sets limit values for noise exposure, nor prescribes measures for inclusion in the action plans. Finally, Member States are required to select and preserve areas of good acoustic environmental quality, referred to as 'quiet areas', in order to protect the European soundscape.

High noise levels are defined in the 7th EAP as noise levels for L_{den} above 55 dB and for L_{night} above 50 dB. During the night, high noise levels can cause sleep disturbance, such as body movements and wakening, starting at L_{night} levels below 40 dB, and with effects on the cardiovascular system that become apparent above 55 dB. All these impacts can contribute to premature mortality (WHO, 2009).

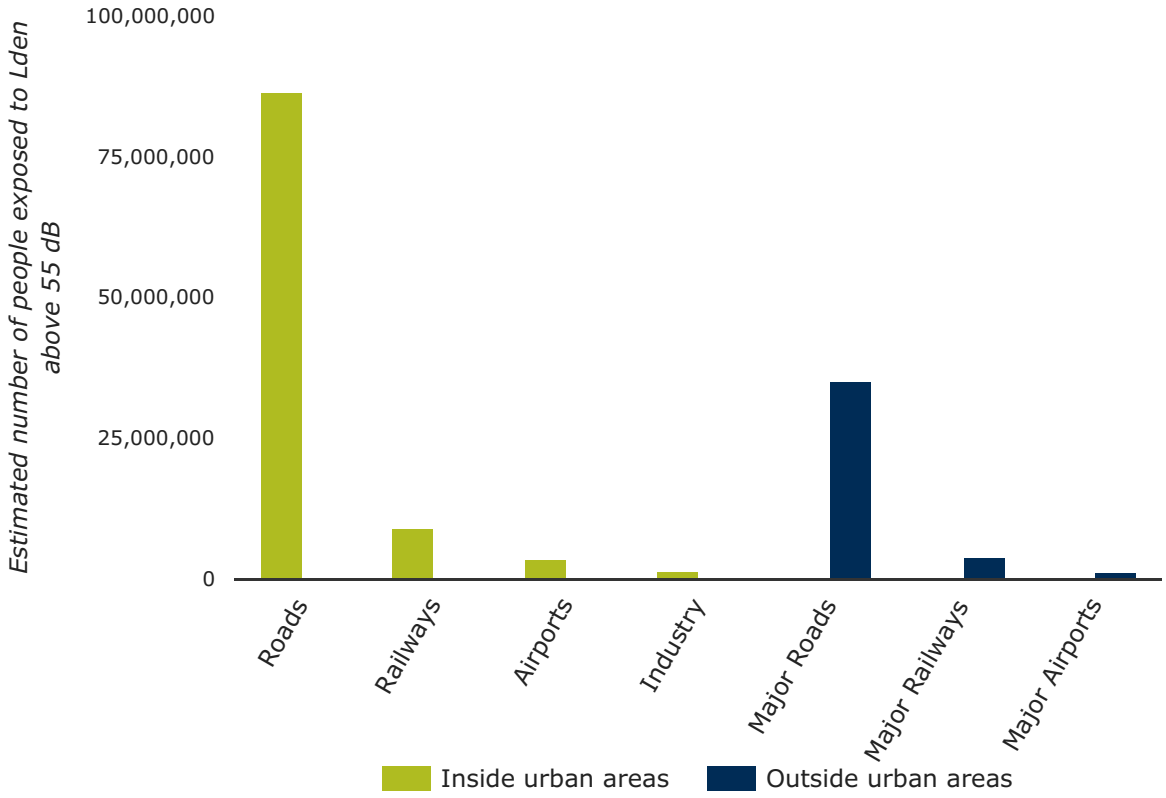
The WHO established a night-time noise guideline for L_{night} of 40 dB for outside noise with the aim of protecting the public, including vulnerable groups such as children, the chronically ill and the elderly. An outside noise L_{night} value of 55 dB was recommended as an interim target for countries where the night-time noise guideline cannot be achieved in the short term and where policymakers adopt a stepwise approach. The WHO night-time noise guideline is stricter than the L_{night} threshold of 50 dB set under the END, providing a higher level of protection for

human health. However, assessments cannot be made by comparing noise levels in Europe with WHO recommended levels, as Member States are not obliged to report this information.

Figure 1 provides an overview of the number of people exposed to levels of environmental noise in Europe that are above the noise indicators set by the END within and outside urban areas. The major source of noise pollution (measured in terms of number of affected people), both inside and outside urban areas, is road traffic. Noise from trains and aircraft has a much lower impact in terms of overall population exposure to noise, but it remains the major source of localised noise pollution (EEA, 2015).

More specifically, it is estimated that more than 125 million people in the EU are exposed to L_{den} levels from road traffic noise that are above 55 dB. Night-time road traffic is another major source of noise exposure, with over 83 million Europeans exposed to harmful L_{night} levels above 50 dB. In addition, many people are also exposed to rail, aircraft and industrial noise, particularly in towns and cities. While aircraft noise does not affect a wide geographical area, the effects extend beyond health impacts on nearby populations to direct effects on the ability of younger generations to concentrate in schools that are affected by aircraft flight paths.

Figure 1. Estimated number of people exposed in the EU to noise above Lden 55 dB, 2012



Data sources:
a. EEA. Reported data on noise exposure covered by Directive 2002/49/EC
b. EEA – Indicator CSI051

Note:
1. 'Urban areas are the urban agglomerations defined as such in the Environmental Noise Directive, that is the part of the territory, delimited by the Member State, having a population in excess of 100 000 persons and a population density such that the Member State considers it to be an urbanised area.
2. The numbers of people exposed can only be summed for the same source inside and outside urban areas and not across sources, since the latter could lead to double counting.
3. 55 dB Lden is the EU threshold for excess exposure defined in the Environmental Noise Directive and indicating an average level during the day, evening and night; dB=decibel.

Examples of measures to reduce noise exposure currently being undertaken at the national level include installing road and rail noise barriers and optimising aircraft movements around airports. However, it is widely acknowledged that the most effective actions to reduce exposure tend to be those that reduce noise at source, for example reducing the number of vehicles on the road, introducing quieter tyres for road vehicles or laying quieter road surfaces.

A major problem for the effectiveness of such measures is that, given the different factors that determine traffic noise, a single measure alone is often not sufficient to significantly reduce exposure.

Efforts to reduce the noise from individual sources tend to be offset by the higher numbers of people being exposed to high noise levels, due to increasing road and aviation traffic and increasing numbers of city inhabitants. Recent trends show a rise in car travel across the EU, with 77 % of passenger-kilometres using car transport in 2013 compared with 65 % in 2000 (EEA, 2015). The construction of new roads can also expose new areas and populations to road traffic noise.

In terms of the availability of data to assess recent trends in noise exposure, data were reported to the EEA in 2007 and in 2012 under two rounds of noise mapping assessments. There are, however, comparability issues between the two reporting rounds, because of a lack of common assessment methods and incomplete reporting of exposure assessments, with as little as 44 – 70 % of the expected amount of data, depending on source, being delivered in the second reporting round. However, the analysis of a sub-set of the reported data that were comparable revealed that exposure to noise has remained broadly constant between 2007 and 2012.

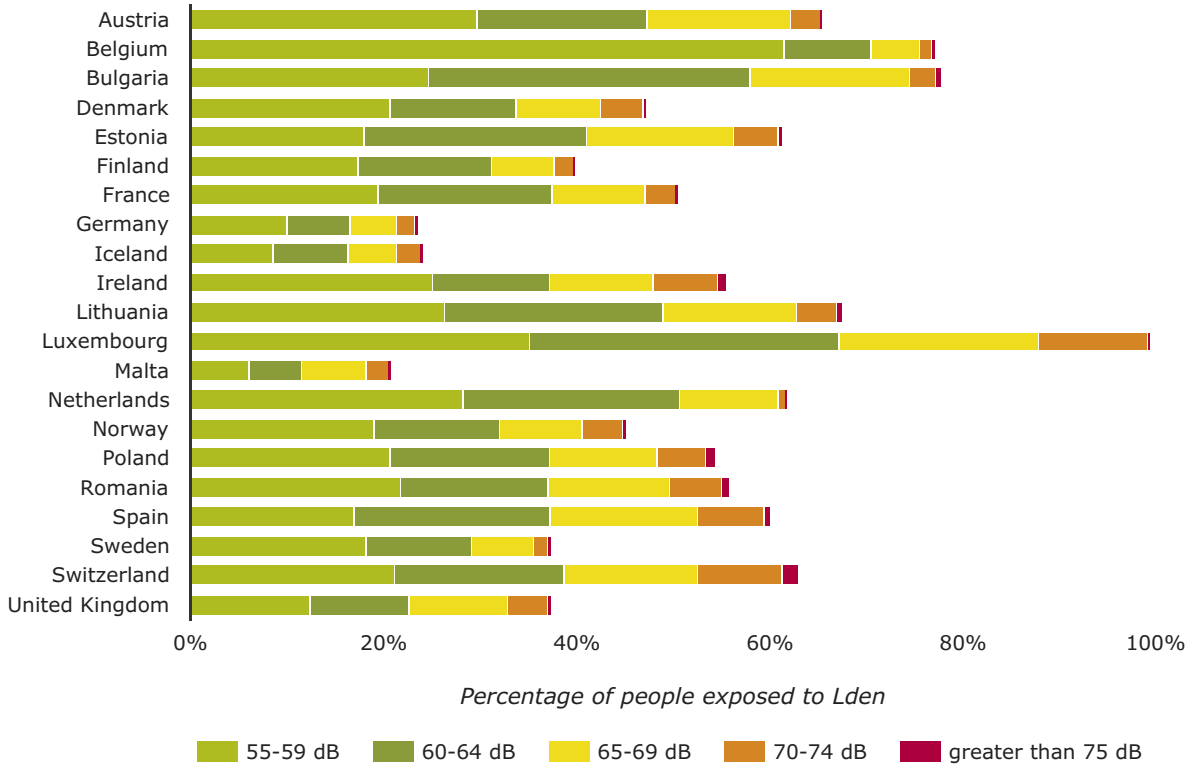
Finally, it is unlikely that noise pollution will decrease significantly by 2020, given that transport demand is expected to increase (EC, 2016), air traffic noise has been predicted to increase (EASA et al, 2016) and the number of city inhabitants is also set to increase (Eurostat, 2016).

Country level information

Road traffic is the most widespread noise source in Europe and the source that causes the largest number of people to be exposed above the Environmental Noise Directive action levels for L_{den} and L_{night}. This is true at the European scale, at country scale and both inside and outside urban areas. Nevertheless, a wide variation can be identified between countries in the number of people exposed to road traffic noise in urban areas. This is significantly influenced by factors such as the number of urban areas per country and the total number of inhabitants per urban area. The correlation between the total number of inhabitants in an urban area and the number of people exposed to road traffic noise is very strong.

Austria, Estonia, Ireland, Lithuania, the Netherlands, Poland, Romania, Spain and Switzerland reported that more than 50 % of inhabitants in urban areas (an urban agglomeration with more than 100 000 inhabitants) were exposed to road noise L_{den} levels above 55 dB, while Belgium, Bulgaria and Luxembourg reported figures of more than 75 % for the equivalent exposure (Figure 2). At the other end of the scale, the number of inhabitants exposed to road noise L_{den} levels above 55 dB in Germany, Iceland and Malta remained below 25 %. As mentioned above, however, country-specific data are not immediately comparable.

Figure 2. Percentage of population exposed to road noise within urban areas above Lden 55 dB, by country, 2012



Data sources: EEA. Reported data on noise exposure covered by Directive 2002/49/EC

Note:
55 dB Lden is the EU threshold for excess exposure defined in the Environmental Noise Directive and indicating an average level during the day, evening and night; dB=decibel.

Outlook beyond 2020

Regarding the long-term outlook for the European soundscape, there are a number of challenges to reducing the exposure of the EU population to noise pollution. Economic growth and expanding transport networks can lead to increased transport levels that could, in turn, increase noise pollution. At the same time, trends towards increasing urbanisation (Eurostat, 2016) could lead to higher numbers of people being exposed. Transport demand, including for passenger cars is expected to increase by 2050 (EC, 2016 and EEA, 2015), with noise from road traffic representing the dominant source of environmental noise and noise from air traffic set to increase (EASA et al, 2016). On the other hand, intelligent transport systems could reduce noise levels from vehicles, in particular road vehicles. While the use of electric cars currently contributes to lower noise levels at low speeds in urban areas, the new EU regulation on the sound levels of motor vehicles (EU, 2014) will require the installation of artificial sound generators in all electric and hybrid vehicles by 2021 to improve safety for pedestrians. Whether or not exposure to noise increases or decreases beyond 2020 depends on the relative rates of these conflicting developments.

About the indicator

The Environmental Noise Directive (END) requires two main indicators to be applied in the assessment and management of environmental noise. The first indicator (L_{den}) is the noise level for the day, evening and night periods and is designed to measure 'annoyance'. The END defines an L_{den} threshold of 55 dB. The second indicator (L_{night}) is the noise level for night-time periods and is designed to assess sleep disturbance. The END defines an L_{night} threshold of 50 dB. These indicators were calculated following the provisions of the END (EU, 2002). Member States must report the numbers of people who are exposed to noise levels above both thresholds for each noise source (e.g. roads, railways, airports, industry). The EEA uses these data to create an indicator for environmental noise in Europe. A complete assessment of exposure to environmental noise and a prognosis regarding the future outlook are hindered by the fact that exposure estimates reported by countries are not complete, with as little as 44 – 70 % of the expected amount of data, depending on source, being delivered in the second reporting round (EEA, 2014). The gaps in the reported data have been filled with expert estimates from the EEA. The lack of comparable and common assessment methods often causes significant inconsistencies between exposure estimates from different countries, within a single country and across the two main reporting rounds (2007 and 2012).

Footnotes and references

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1. AIRS_PO3.1, 2016, Outdoor air quality in urban areas, European Environment Agency

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