Environmental noise in Europe 2025

Eulalia Peris - European Environment Agency

UNECE – Task Force on Vehicle's Sound TFVS-19-03

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Our mandate

- **Support** countries on policy implementation (**Environmental Noise Directive 2002/49/EC**)
- **Collect** the data submitted under Environmental Noise Directive
- Produce **EU-wide assessments** on noise.
- **Collaborate** with EU institutions, EU countries and other bodies on policies related to noise pollution.
- Provide **objective information** for citizens and policy makers on noise.

Increasing calls for action on transport noise pollution

WHO 2018 – Environmental Noise Guidelines

Guideline values for long-term noise exposure from different transport sources.

EC 2021 – Zero Pollution Action Plan

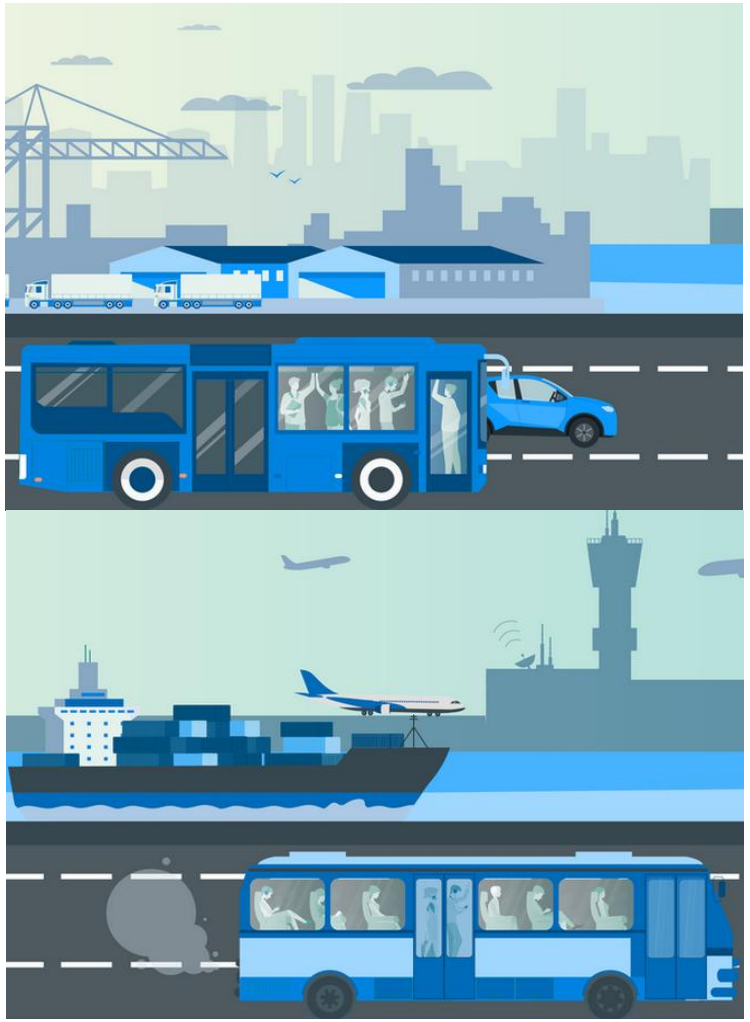
Ambition to cut 30% the number of people chronically disturbed by noise by 2030 compared to 2017 levels.

ECA 2025 – Urban pollution in the EU

Report from the European Court of Auditors evaluating current EU noise directive and recommending actions to be taken by the EC

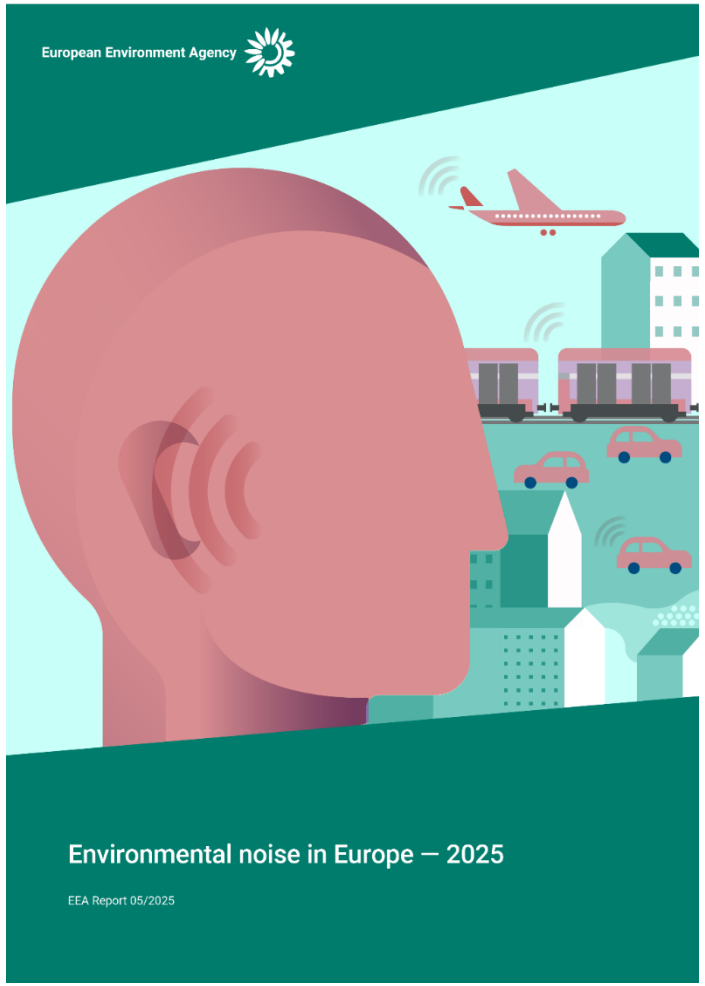
Research community – New evidence

Studies and meta-analyses demonstrating relationships between transport noise exposure and a wide range of diseases.



Environmental noise in Europe — 2025

- Flagship report of the European Environment Agency
- Latest data on noise pollution in Europe.
- Based on reports under the Environmental Noise Directive.
- Focus on health and environmental impacts.
- Integrates new scientific evidence.
- Covers road, rail and air traffic.



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Data overview – EU Environmental Noise Directive

Environmental Noise Directive 2002/49/EC

Objective	Protect human health
Obligations	• Map and assess environmental noise from major transport and industrial sources every 5 years. • Develop and update noise action plans for affected areas
Standards	Defines reporting thresholds only /No legally binding limit values
Enforceability	Requires action plans, but does not impose enforceable noise limits

Data overview – EU Environmental Noise Directive

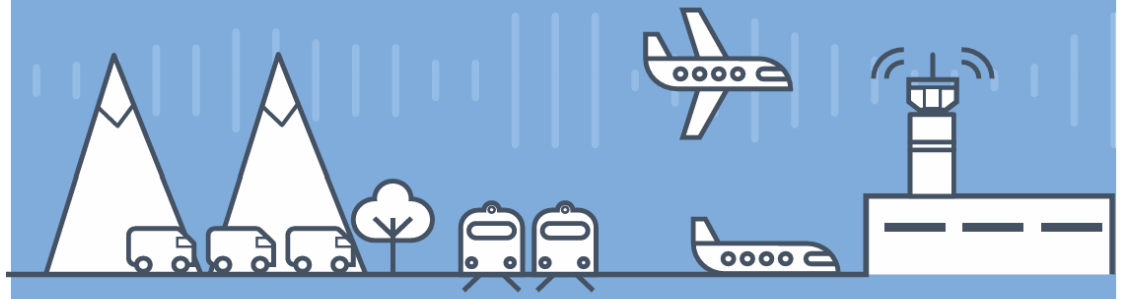
- Coverage Strategic Noise Maps

Inside urban area

Roads, railways, airports and industries inside urbanised areas – called **agglomerations** – with a population exceeding 100,000 inhabitants and a population density such that the Member State considers it to be an urbanised area.

Outside urban area

Major roads > 3,000,000 passages/year
Major railways> 30,000 passages/year
Major rairports > 50,000 movements/year



Total number of agglomerations: 433

433
with road traffic

412
with rail traffic

178
with air traffic

289,000km

44,000km

69 airports

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Data overview – EU Environmental Noise Directive

- Reporting Thresholds

Environmental Noise Directive (END)

Countries need to report strategic noise maps for noise levels starting at 55 dB Lden and 50 dB Lnight

55 dB Lden 50 dB Lnight	55 dB Lden 50 dB Lnight	55 dB Lden 50 dB Lnight

≠

WHO Environmental Noise Guidelines 2018

Source specific recommended noise levels that are lower than the END thresholds

53 dB Lden 45 dB Lnight	54 dB Lden 44 dB Lnight	45 dB Lden 40 dB Lnight

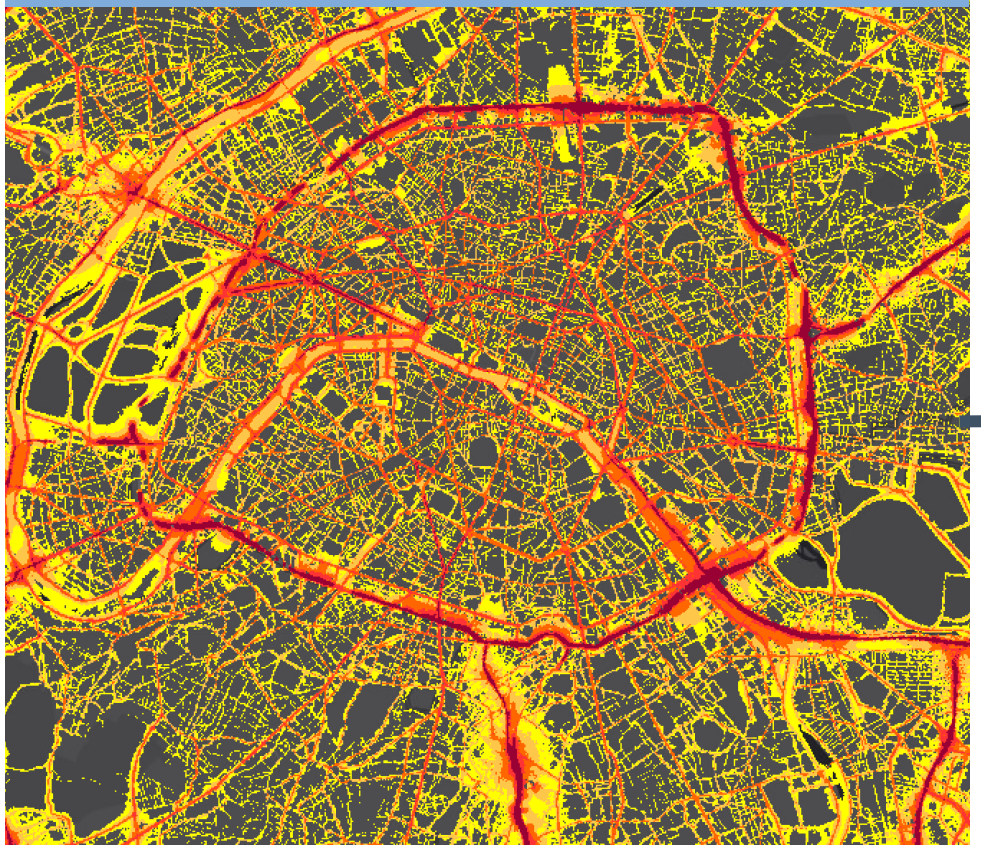
* New evidence on road traffic noise suggests that adverse health effects start at lower levels than those by the WHO

Lden: Day-evening-night average noise level over all days, evenings and nights in a year
Lnight: Nighttime average noise level over all nights in a year

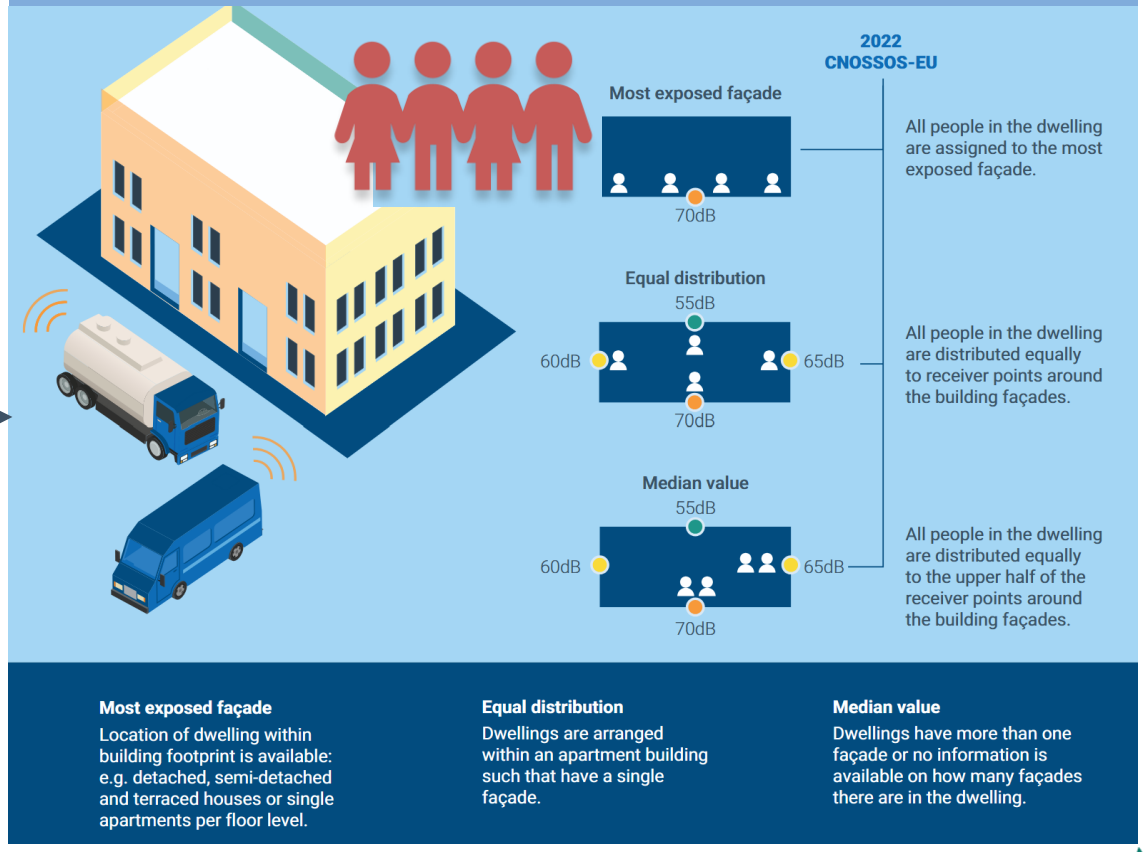
Data overview – EU Environmental Noise Directive

- Data analysis

Noise contour maps



Number of people exposed to noise



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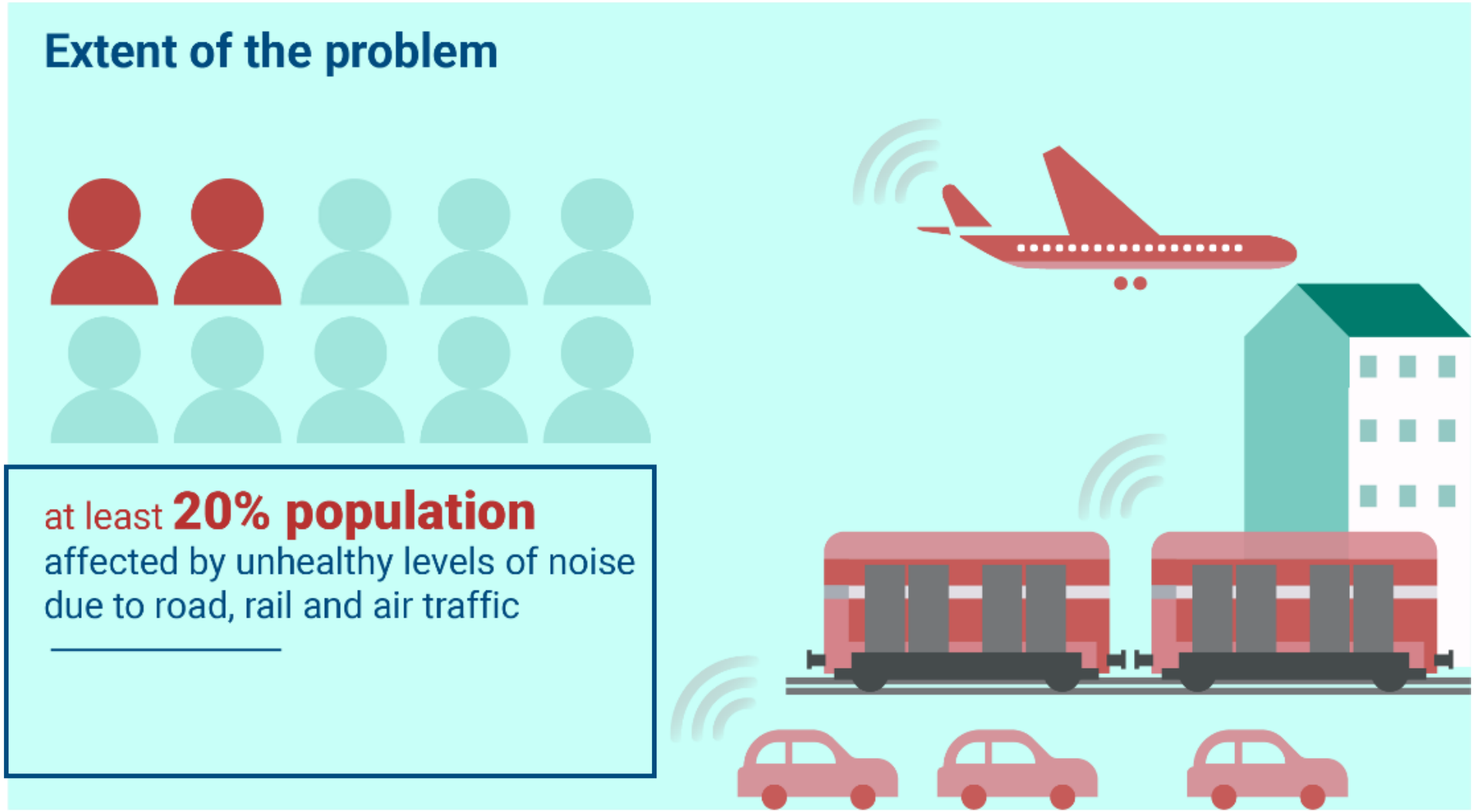
Over 100 million affected in Europe



* Health impacts already occur at noise levels below reporting thresholds under the END.

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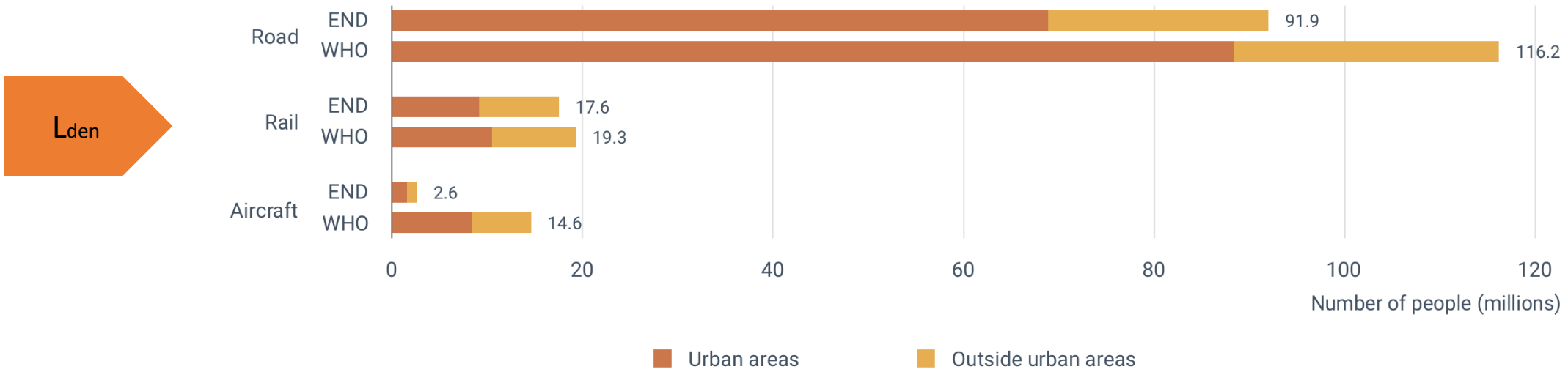
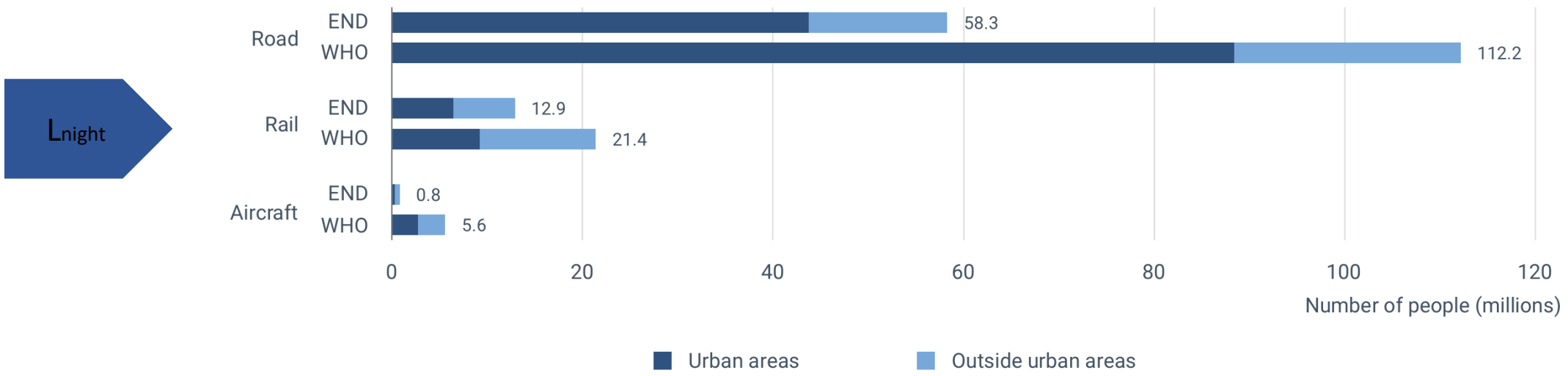
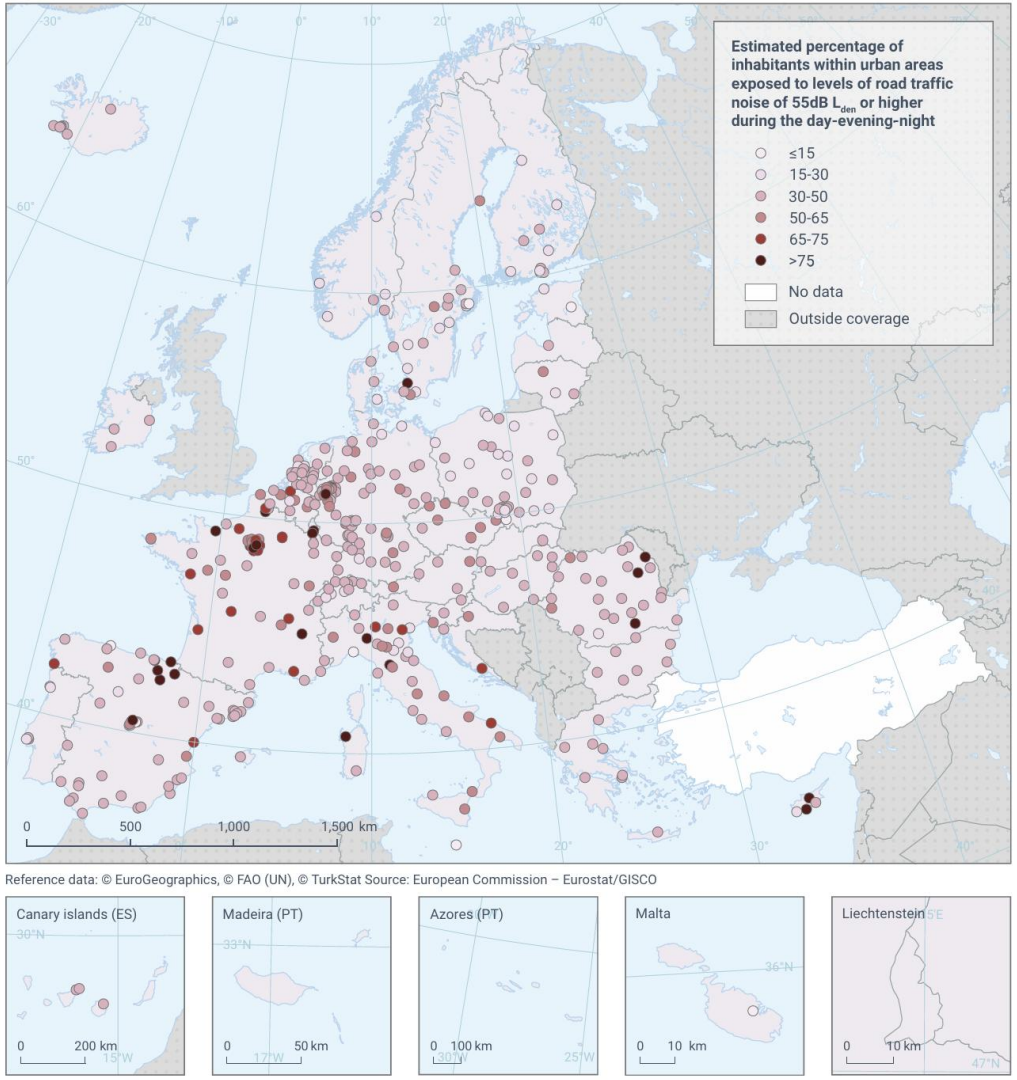
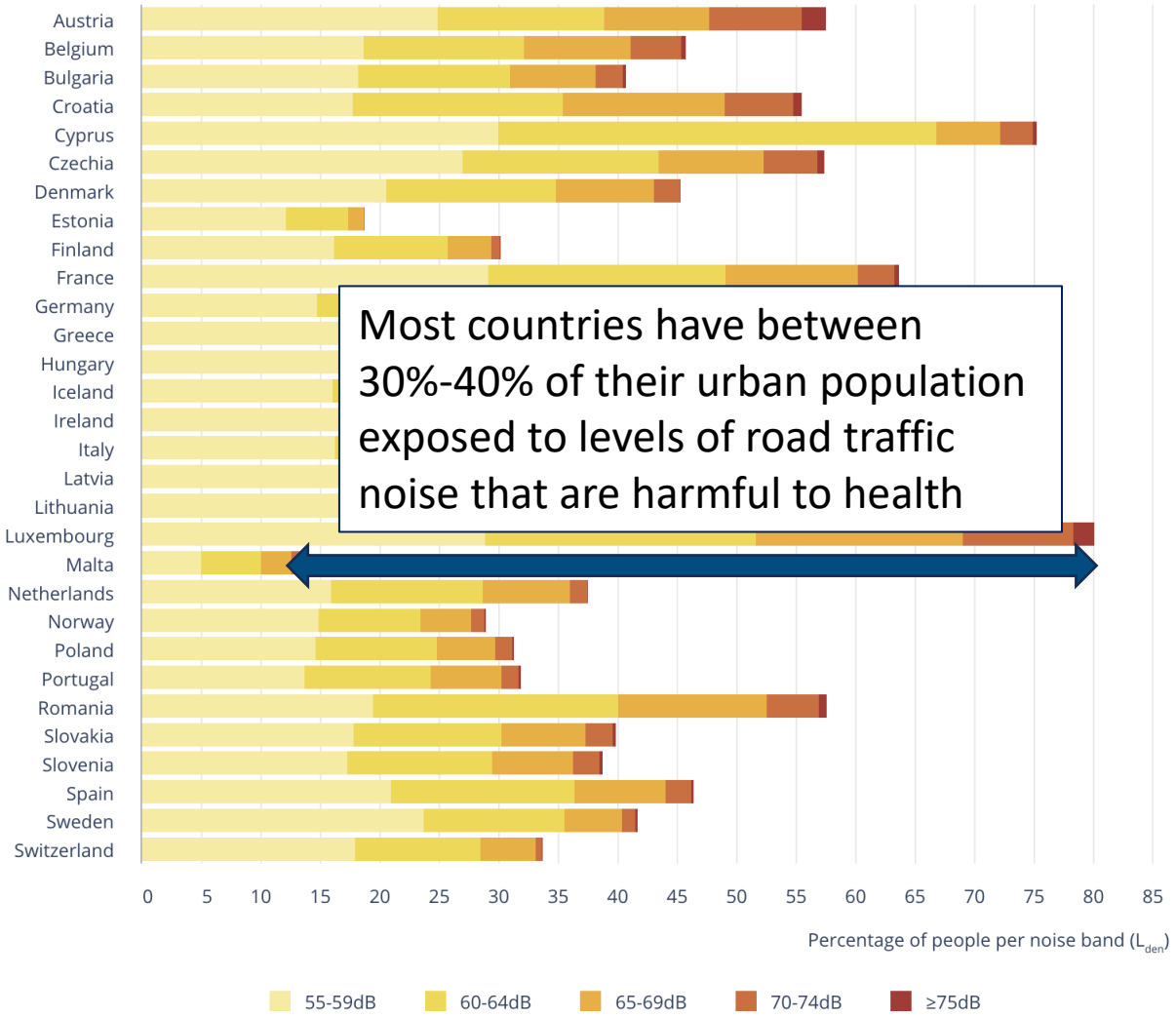
Number of people affected END vs WHO





Road traffic noise the most prevalent source





Most countries have between 30%-40% of their urban population exposed to levels of road traffic noise that are harmful to health

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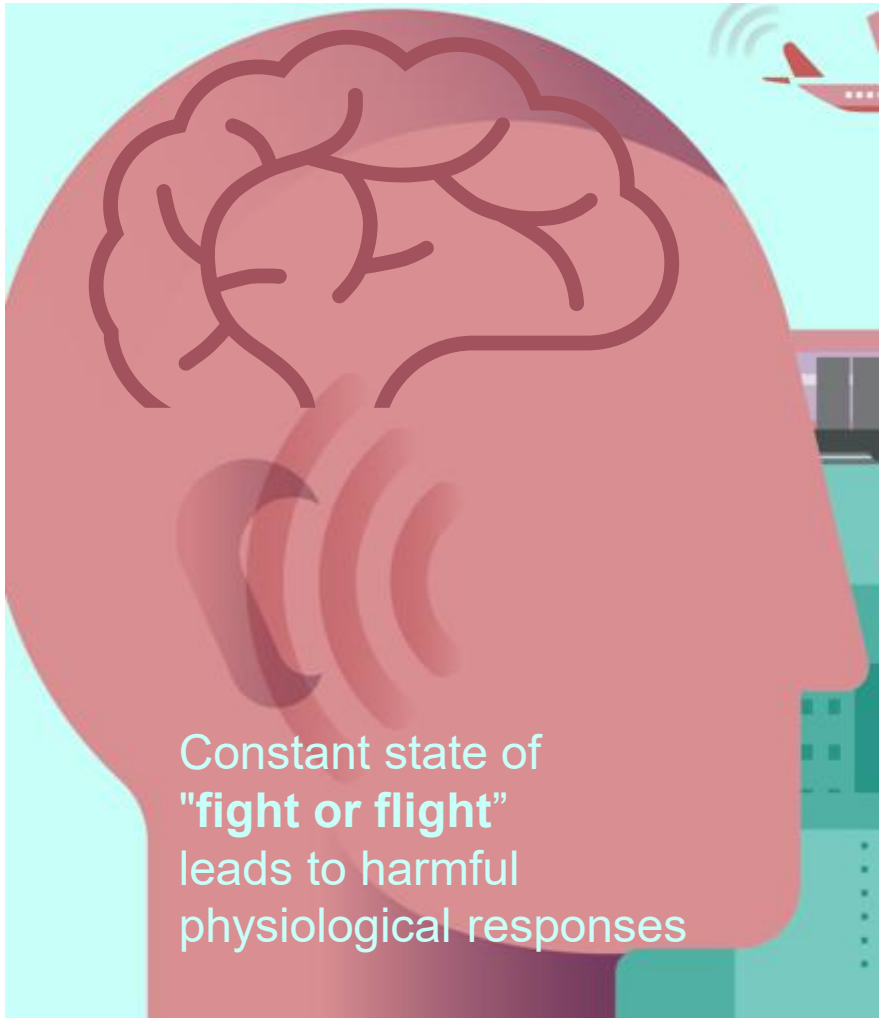
Biological mechanisms between transportation noise and ill health



Sleep disruption
Awakening
Disturbance
Fragmented sleep
(...)

Stress
Annoyance, anger
HPA axis activation*
Release of stress hormones
SNS activation**
(...)

Inflammation
Oxidative stress

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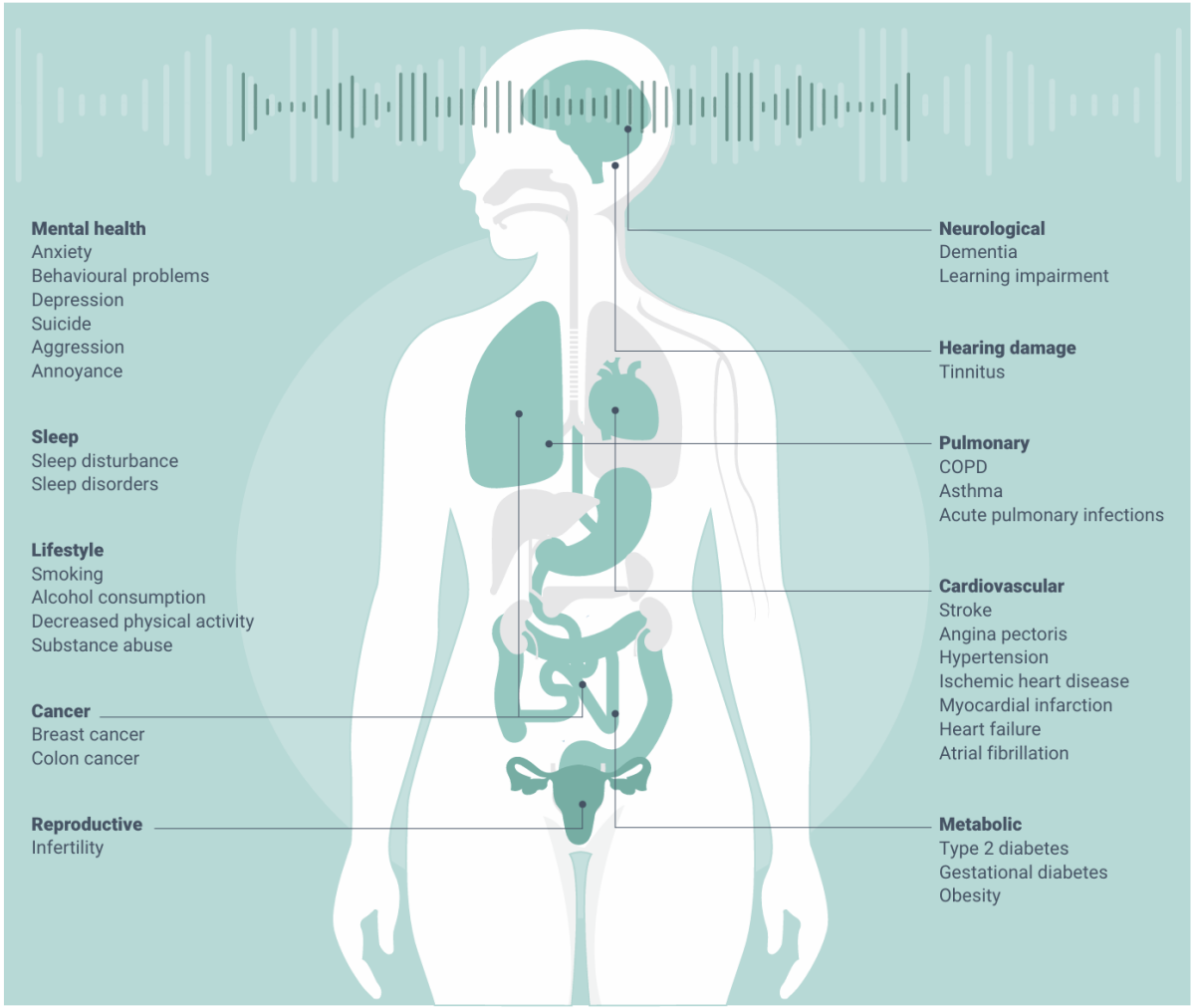
Noise causes serious and wide-ranging health impacts

Figure 3.2 **The broad health effects of transportation noise**



Notes: List of potential and established impacts. Non-exhaustive list of diseases or system disfunctions.

Sources: Adapted from Hahad et al., 2024.

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Adults: evidence from transportation noise studies

	Road	Rail	Aircraft
Annoyance	High 10% HA at 53 dB	High 10% HA at 54 dB	High 10% HA at 45 dB
Sleep disturbance	High 10% HSD at 45 dB	High 10% HSD at 44 dB	High 10% HSD at 40 dB
All-cause mortality	High 5.5% risk increase per 10dB	Very low -	Very low -
Cardiovascular disease IHD, Stroke, Heart Failure	High 4% risk increase per 10dB	Moderate No risk increase	Low -
Diabetes Type 2	High 6.2% risk increase per 10dB	Low -	Low -
Depression	Moderate 3.8% risk increase per 10dB	Very low -	High 14% risk increase per 10dB
Dementia	Moderate 5.9% risk increase per 10dB	Moderate 6.8% risk increase per 10dB	Very low -

Source: Engelmann et al. 2024; Röösli et al. 2025

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Health impacts of road traffic noise in Europe

Health impacts of road traffic noise

almost
13 million
Europeans
experience
long-term high
annoyance

approximately
3 million
suffer from severe
sleep disturbances
due to transport
noise

New cases in 2021

54,000
premature
deaths

41,000
cardiovascular
disease cases

18,500
type 2 diabetes
cases

Emerging health impacts

246,000
Depression

15,000
Dementia

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Children: evidence from transportation noise studies

	Road	Rail	Aircraft
Behavioural difficulties	Moderate 7.3% risk increase per 10dB	Low -	Very low -
Overweight	Moderate 6.3% risk increase per 10dB	Very low -	- -
Learning impairment	Low Heterogeneous cognitive measures across studies	Very low -	Moderate 15% risk at 64 dB compared to 10% at 50 dB

Source: Engelmann et al. 2024; Röösli et al. 2025

Impact of road traffic noise on children’s health

Impacts on children’s health

52,800
behavioural issues

222,000
Overweight

472,000
learning difficulties

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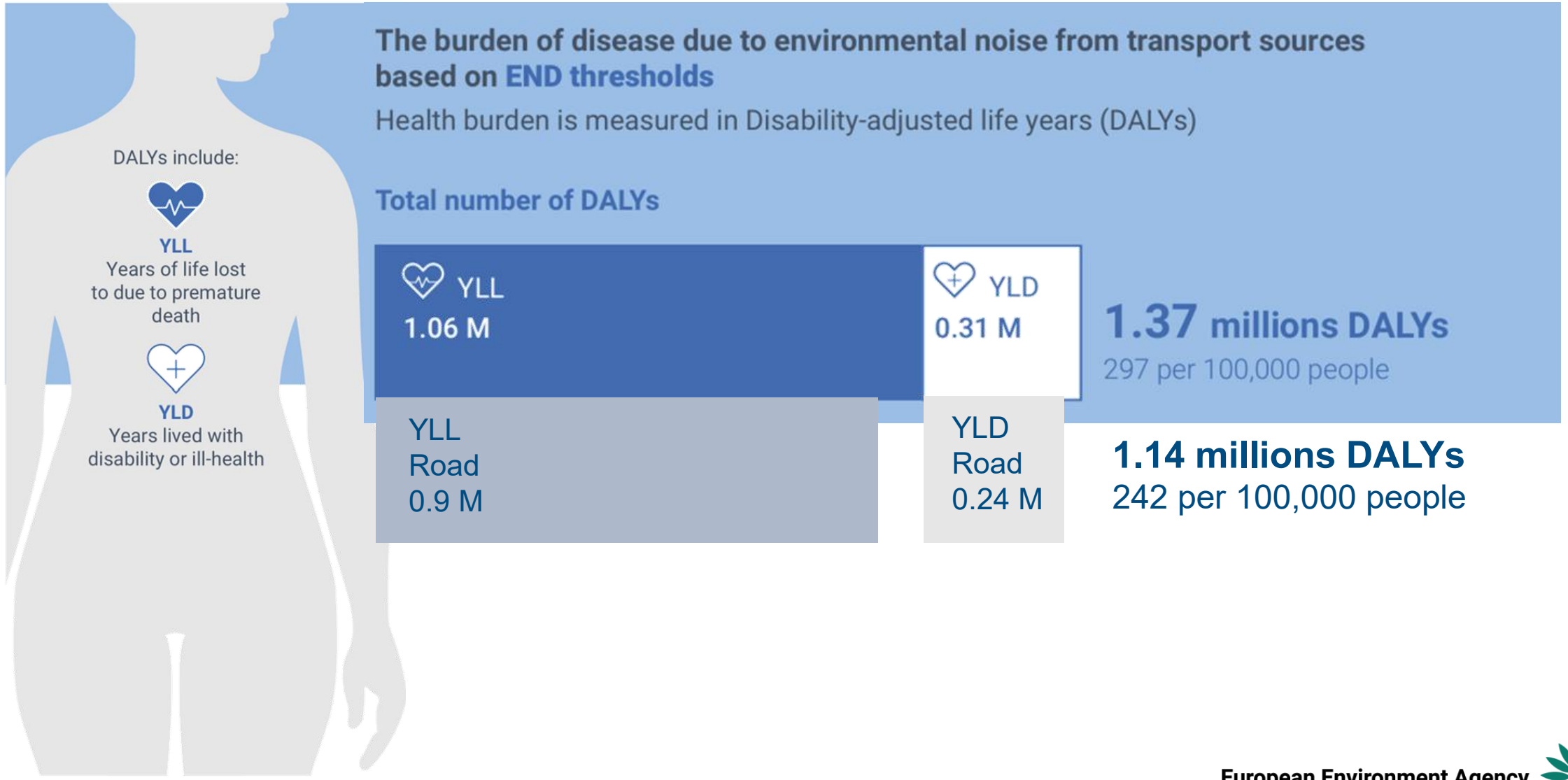
Burden of disease due to transport noise in DALYs



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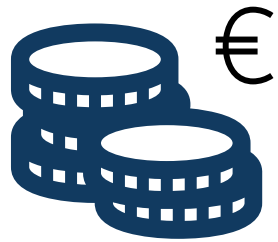
Economic burden of environmental noise

- DALYs valuation method → EUR 70,000 per DALY

END thresholds		Road	Rail	Aircraft	Total ([a])
Costs in billion (EUR)	Morbidity	16.7	4.0	0.7	21.4
	Mortality	61.3	12.1	0.8	74.1
	Total	**78.0**	**16.1**	**1.5**	**95.6**
% of GDP		**0.51%**	**0.10%**	**0.01%**	**0.62%**

*Outcomes included: premature mortality, high annoyance, high sleep disturbance, Type 2 Diabetes, CVD



Health impacts and burden of disease – comparison END vs WHO

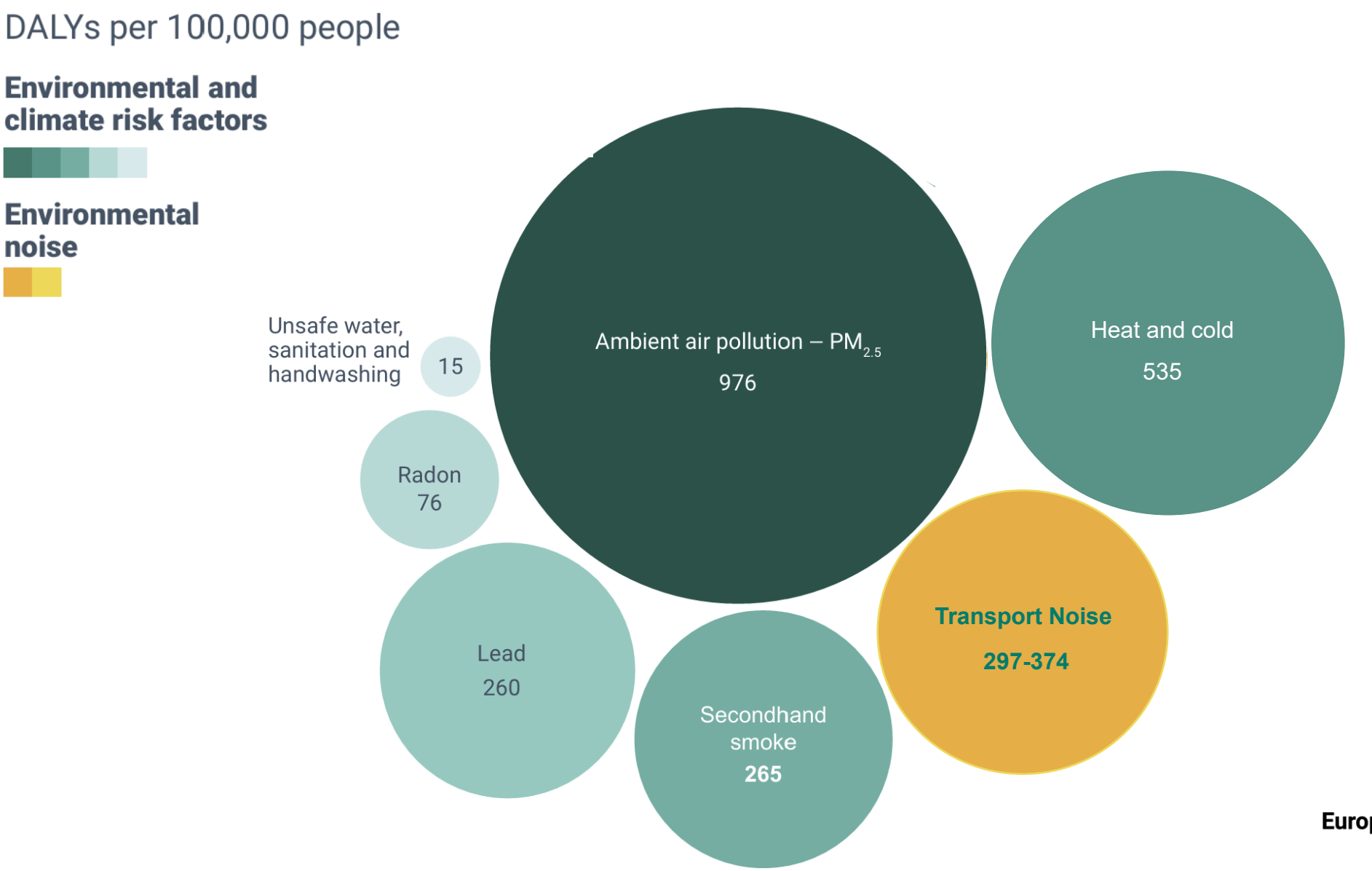
- Report also presents HRA using the number of people exposed at levels starting at WHO recommended levels

Impacts based on WHO recommended levels

≈ 20 % higher

Number of people affected, DALYs, economic costs

Noise pollution is a leading environmental health risk



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Progress and scenarios 2030

2030 Noise Target:
Reducing the share of people chronically disturbed by transport noise by 30%

	Conservative scenario 2030 Scenario considering the implementationof current regulations and a small increase of mitigation measures following current trends	Optimistic scenario 2030 Scenario considering extensive mitigation measures and policies
Road	· Implementation of the regulation of the sound level of motor vehicles · **25%** electrification of the fleet · Increased use of low noise asphalt **3%** · Increased use of noise barriers on major roads **0.8%**	· Implementation beyond the regulation of the sound level of motor vehicles · **50%** electrification of the fleet · Increased use of low noise asphalt **8%** · Increased use of noise barriers on major roads **2.5%** · Reduction to 30km/h speed limit in 30% of major roads inside agglomerations
	· Implementation of the regulation of the sound level of motor vehicles · Increased use of low noise asphalt **3%** · Increased use of noise barriers on major roads **0.8%**	·Implementation beyond the regulation of the sound level of motor vehicles · Increased use of low noise asphalt **8%** · Increased use of noise barriers on major roads **2.5%**

- Evaluate progress to target using END data
- Evaluate progress using number of people highly annoyed
- Develop two scenarios one conservative and one optimistic
- Focus on actions that are currently available to competent authorities and are reported in action plans

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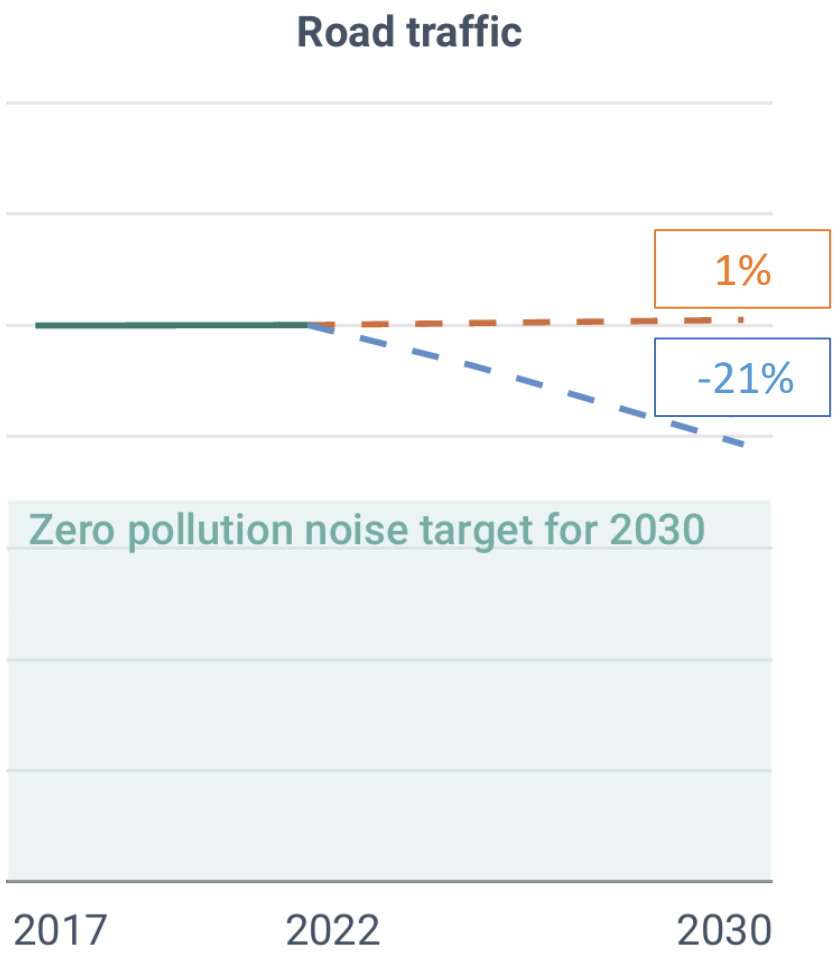
Progress and scenarios 2030



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Evaluation on measures considered in the scenarios

Road	Electric vehicles	Limited fleet application and benefits mainly in low-speed urban areas.
	Low noise asphalt	Most effective on major roads with speeds above 30km/h. Requires maintenance/replacement.
	Speed limits	High localised benefits, mainly on urban roads exceeding certain speeds.
	Noise Barriers	Very localised benefit, with little applicability in dense urban settings.
	Regulation vehicle emissions	Modest noise reduction overall, but broadly applicable across the fleet.

Challenges to reduce transport noise pollution

High population density

Ongoing urban development and population growth contribute to increasing noise exposure.

Resistance to traffic measures

Restricting car use, low-emission zones, reduction of speeds face opposition. Regulatory complexity and conflicting interests.

Limited funding

Many countries struggle to secure investment for noise measures. Austerity policies have constrained resources for noise measures.

Dependence on vehicles

Dependence on private car use. Higher prevalence of older noisier vehicles in some countries.

Lack of awareness

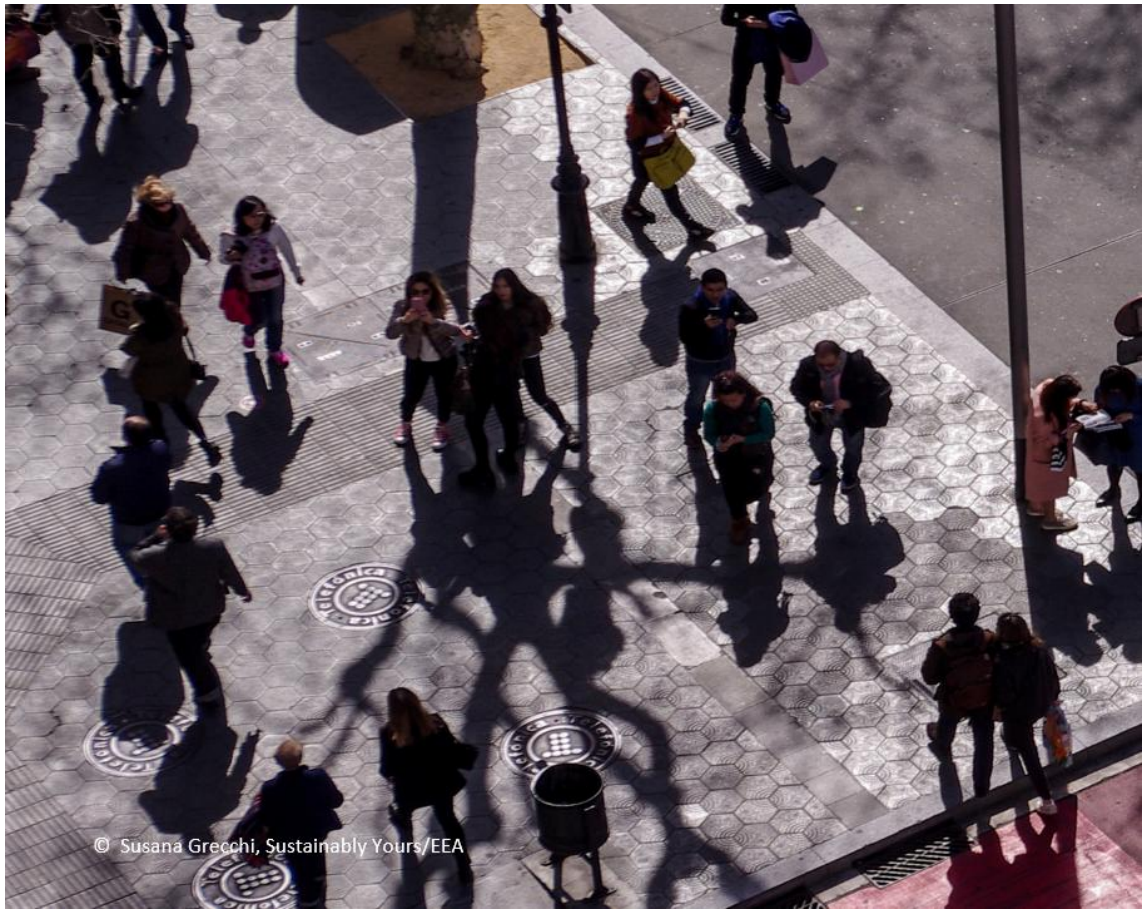
Lack of awareness regarding noise as a public health issue leads to low prioritisation, low political support and action.

Inadequate planning

Big infrastructures located in densely populated areas. Emerging noise sources.

Examples from countries on actions to reduce noise pollution

- Policy improvements
- Tackling high noise emitters
- Public engagement
- Road speed reduction
- National rail noise reduction programmes



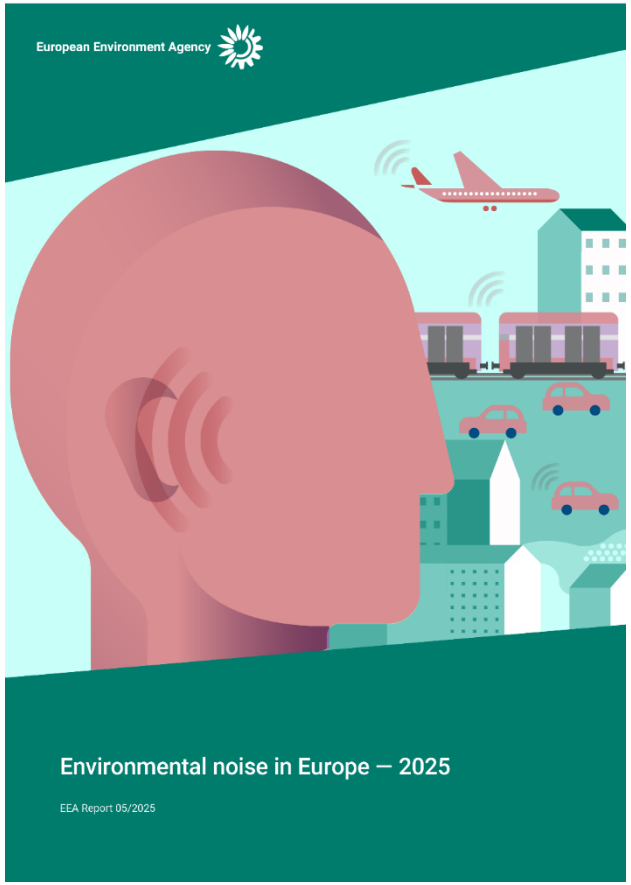
Pathways to reduce noise pollution

- Measures with wide application i.e. legislative and regulatory measures that tackle noise at source
- Urban planning and long-term noise strategies
- Maximising synergies between noise and other policy areas
- Raising public and policy awareness

Key takeaways

- Noise pollution affects millions of people in Europe causing significant impacts on health and the environment.
- Impacts presented are likely underestimated
- More action is needed to prevent and reduce environmental noise
- Full report available in EEA webpage:

  ‘Environmental noise in Europe – 2025’



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Acknowledgments

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