

Climate Noise

The intersections between climate change and noise pollution



Climate Noise:

The intersections between climate change and noise pollution

Climate change poses an existential threat to the environment and human health, necessitating immediate and cohesive action.

While high in the public and political discourse, as well as in public health, other environmental stressors, such as noise pollution, are much less researched, talked about and visible. However, the impact of noise pollution on public health is significant, across Europe, and globally. The interplay between climate change mitigation and noise pollution reduction reveals a cascade of public health benefits, particularly for marginalised populations who often bear a disproportionate environmental burden.

Noise can have a significant health impact and is the second most significant environmental health risk that Europeans face (European Commission, 2021). The health burden has been estimated at at least 1 million healthy years lost in Western Europe each year due to noise pollution, the bulk of which is traffic noise (World Health Organization, 2018), and there is an association between exposure to traffic noise and all-cause mortality (independent of air pollution) (Cole-Hunter et al., 2022). Noise related to transport is the most significant source of noise pollution in Western Europe (European Environmental Bureau, n.d.). The European Environmental Agency (EEA) estimates from 2017 shows that at least 95 million people in the EU are affected by road traffic noise levels above the guideline of 55 dB during the day, and at least 65 million by levels above the night time recommendation of 50 dB or more overnight (European Environmental Agency (EEA), 2021). This level of noise has a significant health impact, with 70 million people in selected European countries being exposed to a level of road traffic-related noise pollution in urban areas that is deemed harmful to health (European Environmental Agency (EEA), 2021). These health impacts are not trivial; they include life-threatening conditions, and analysis estimates that in two studied Spanish cities, noise was associated with 148 premature deaths per year (Iungman et al., 2021).





The health effects include short and long-term effects, and direct and indirect effects.

Direct effects include damage from noise energy, such as tinnitus and hearing loss. Indirect effects are mediated by chronic noise stress and inflammation, and include sleep disturbance and annoyance, as well as serious medical conditions such as hypertension (high blood pressure), ischaemic heart disease, cognitive impairment in children and cognitive decline in adults, and mental ill-health (European Commission, 2021; World Health Organization, 2018).

Emerging evidence suggests effects outside of cardiovascular health, including respiratory diseases, cancer, neurodegenerative diseases, and psychiatric disorders (Cole-Hunter et al., 2022). There are serious social effects, such as impairment of social interaction, including on a community level (European Commission, 2021).

Looking through a Planetary Health lens, the effects of noise pollution increase further. Noise causes stress and immune disruption not just

in humans, but in animals, as well as having the ability to disrupt animal communication, social functioning, behaviour, cognition and orientation, and may cause injury or death (Erbe et al., 2022; The Lancet Regional Health – Europe, 2023). Noise pollution has also been found to affect plant growth, seeding and biodiversity (Phillips et al., 2021; The Lancet Regional Health – Europe, 2023). Therefore, noise pollution is affecting factors that relate to the reliability of food systems, to natural spaces, and to resilience against infectious disease and environmental threats. The effects of noise pollution are wide-ranging, and it was recently identified by the Swiss Tropical and Public Health Institute that noise pollution has an impact on nearly all Sustainable Development Goals (SDGs) (Röösl, 2022). The impacts of noise pollution range further than just human health, and affect Planetary Health, as well as being highly interlinked with multiple other Planetary Health stressors, such as air pollution.

In the European policy context, the European Union (EU) is aiming for Zero Pollution by 2050. This includes noise pollution, as well as emissions pollution.

With this vision in mind, and with noise being Europe's second most significant environmental health hazard, there is scope to reduce the impacts of noise through source control and reducing exposure. The Environmental Noise Directive 2002 is how the EU envisions this change happening, with the third implementation report published in 2023. While the report showed progress since the previous report in 2017, it also showed that "the current number and intensity of actions must be increased if the number of people affected by transport noise by is to be reduced by 30% by 2030, as set out in the Zero Pollution Action Plan" (European Commission, 2023). There is a role for revision of the Directive, as well as stronger implementation.

While noise pollution should remain an independent focus in reducing the effect of pollution on human health and Planetary Health, it should also be seen alongside climate change, for the synergistic health effect that polices reducing climate impact will have on noise pollution levels, and the impact on Planetary Health. Climate change and noise pollution impacts both stand to benefit from systemic changes that Europe needs to see for a healthier future. These changes can positively affect health equity; marginalised and vulnerable populations have been found to suffer higher exposure from noise pollution in Europe (European Environmental Agency, 2019). This is on the background of increased vulnerability and decreased resilience, through multiple factors such as lack of means, discrimination and social exclusion. The Just Transition to cleaner, more sustainable systems stands to have the most benefit to these marginalised and vulnerable populations.



Interlinkages Between Different Systems, Populations and Exposures Related to Climate Change and Noise Pollution



This infographic shows the multiple interconnections between selected systems, factors and populations in regard to climate change, noise pollution and public health. Each section represents a multitude of sub-factors, and the arrows demonstrate the interdependencies and interconnections between these, and how changes in one can affect another in the wider system. This illustrates that increased sustainability or improvements in one system can positively benefit another system, factor or population health.

(Cooley & Schoeman, 2023; European Public Health Alliance (EPHA), 2023; World Health Organization, 2016, 2023)



Fossil Fuel Dependence and Combustion-based Transport

For climate change risk to be reduced, fossil fuels need to be phased out rapidly.

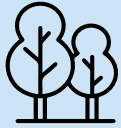
This also means that the systems that rely on fossil fuels in the last century need to be transformed, such as power generation and mobility. While shifting to renewable energy sources for these systems will have a tremendous impact on air pollution exposure, the decarbonisation efforts will also positively impact noise pollution levels. For example, alternatives to internal combustion engines can produce less noise at low speeds, speeds which are relevant in urban areas in Europe (European Public Health Alliance (EPHA), 2023). Increasing public transport use can also have a positive effect on noise pollution, as the number of vehicles needed to move people is less with public transport than with private cars. The flow on effects of shifting from private vehicle use also has other effects; less congestion and induced traffic, less private vehicle-dedicated infrastructure and more equitable use of space.

Further though, prioritising forms of active transport stands to greatly reduce noise, as travelling by foot or bicycle produces much less noise than motorised mobility. Motorised traffic is the top cause of noise pollution in Europe (World Health Organization, 2018). Active transport infrastructure therefore is an investment not just in healthier, more climate-friendly

systems of mobility, but also in noise pollution abatement. Not to mention other factors such as air pollution, physical activity and mental health.

Changes to transport patterns have the ability to positively influence public health of the most marginalised populations. Marginalised populations may be more likely to use public transport and active transport, such as lower income groups (Starkey & Hine, 2014), and stand to benefit from upgrades to both, but also stand to benefit from decreases in noise pollution due to increased exposure to harmful noise currently experienced (European Environmental Agency, 2019).

In terms of energy production, fossil fuel extraction and processing produce noise, and oil and gas exploration has been specifically identified as causing noise pollution and public health risk, outside of the emission of air and carbon pollutants (The Lancet Regional Health – Europe, 2023). While there is noise produced by production, construction and maintenance of renewable energy infrastructure, the operation of solar panels, as an example, produces little noise. Other forms such as hydroelectric and wind energy produce noise, which should be considered and mitigated when looking to realise these co-benefits, in terms of policy and local effects of noise pollution.



Urban Greening and Biodiversity

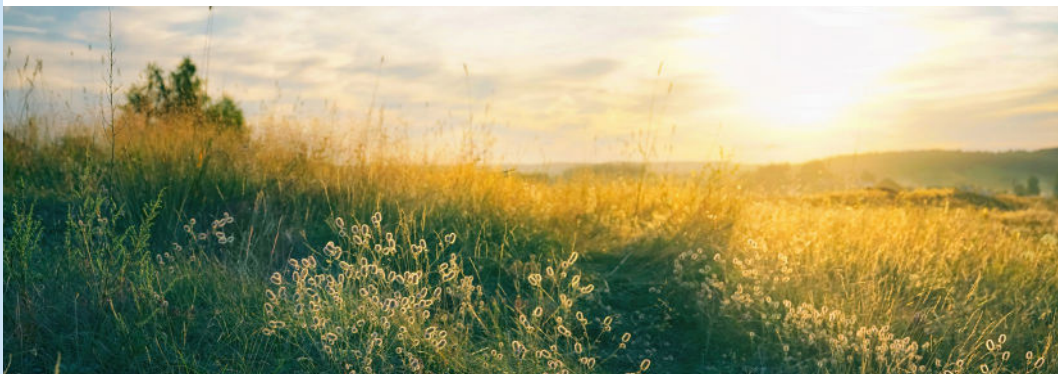
Natural green spaces, particularly in urban areas, have a strong role to play in both reducing exposure to environmental stressors and extremes related to noise and climate change, but also in mitigating both. Green spaces are able to disperse noise, such as traffic noise, reducing the harmful effects of noise on the experiencer (World Health Organization, 2016). They can support plant and animal function and biodiversity. They are a nature-based solution which helps buffer against extreme weather events, but can also sequester carbon and air pollution from the atmosphere. They can cool temperatures in urban areas and are able to reduce the effect of the Urban Heat Island (World Health Organization, 2017).

Green spaces can also have a profound effect on mental health. Studies in the UK have found a correlation between urban greenery and antidepressant use rates, finding that one extra urban street tree per square kilometre to be associated with 1.18 per 1000 population less prescriptions for antidepressants in the local area (Taylor et al., 2015). This

comes under the realm of Planetary Health; there exists an interlinkage between access to nature, green space and human health in the form of mental health, of which noise is also a factor (World Health Organization, 2016).

Green and blue spaces can represent one tool to address inequities, particularly for marginalised populations, particularly in cities. This is both in terms of those with comorbid medical conditions, including related to physical activity and mental health, but also in terms of environmental exposures, such as heat and air and noise pollution. Marginalised populations suffer more greatly from the Urban Heat Island Effect (Witze, 2021), as well as other environmental exposures in Europe (European Environmental Agency, 2019), and therefore stand to benefit the most.

Natural spaces and urban greening therefore sit at another intersection of public health benefit derived from climate change mitigation and noise pollution abatement. Positive benefits are to be seen in both realms from interventions to promote, expand and protect green spaces.





Enhanced Building Design



Upgrades such as double-glazed windows see that heat is kept more efficiently inside, reducing wastage, and therefore, energy use, but also block outside noise. A dual benefit for noise pollution and climate change is seen, mutually reinforcing public health gains.

Again, marginalised populations stand to benefit from this, as these populations can be more exposed to poor housing quality (European Environmental Agency, 2019), including factors such as energy inefficiency and subpar efficiency measures, as well as being exposed to excess noise pollution and noise leakage.

Building design, insulation and building regulations both have a role to play in reduction of noise pollution related harm and climate change, in that buildings designed to hold heat better and manage energy more efficiently can also benefit from a sealed building envelope that also prevents noise (Cooley & Schoeman, 2023; European Commission, 2021).

It should be noted however that ventilation needs to be also a cornerstone of building energy efficiency, as to avoid health harm from poor indoor air quality.



Community Engagement and Awareness

Addressing climate change fosters community engagement and raises environmental health awareness, which can be an important factor when addressing Planetary Health as an all-encompassing concept.



Identifying the excess risk faced by marginalised population helps sustainability changes become an investment in health. For example, it has been identified that the benefits for air pollution related morbidity and mortality would pay off the climate change mitigation measures needed to be in line with the Paris Agreement, meaning that savings related to air pollution alone are greater than investment cost in climate mitigation (Markandya et al., 2018). Furthering this, reductions in noise-related public health harm help offset this further; intervention to protect Planetary Health has a range of known and unknown public health benefits, such as those seen from reducing noise pollution.

Establishing Planetary Health, and the myriad of positive interactions on health from Planetary Health protection, as a cornerstone of EU policy-making is an important step.

Building the knowledge and awareness base can help public health, the public and policymakers prioritise factors of Planetary Health and see greater benefits from sustainable changes. Building this critical mass and public and political buy-in is an important task for public health, and illustrating health co-benefits can be a helpful message in building this support.

Research into the harms of noise pollution, and the interaction with climate mitigation and adaptation should be a priority, especially when it comes to the disproportionate effect on the most marginalised and vulnerable. Efforts should also be made to expand the scope of this data and research; EU-based research exists, but data and research in the European neighbourhood is less developed and established. The health of the EU States and the European neighbourhood are interrelated, through movement of people, but especially when considering Global Health Strategy and the impacts of climate change.

Addressing climate change offers a myriad of interconnected public health benefits, particularly through the reduction of noise pollution-related harm.

The emphasis on protecting marginalised populations and addressing unequal environmental burdens opens avenues for substantial improvements in global health equity, including across societies, nations, regions and generations. By seizing the opportunities presented in Planetary Health, including realising public health co-benefits, and the interrelation of different environmental exposures and health, under the banner of Planetary Health, we will help protect public health and ensure returns on investments, as well as help protect the most marginalised and vulnerable.



By Cale Lawlor - Senior Policy Manager, EPHA

For enquiries about this topic, please contact epha@epha.org

References

- Cole-Hunter, T., So, R., Amini, H., Backalarz, C., Brandt, J., Bräuner, E. V., Hertel, O., Jensen, S. S., Jørgensen, J. T., Ketzler, M., Laursen, J. E., Lim, Y. H., Loft, S., Mehta, A., Mortensen, L. H., Simonsen, M. K., Sigaard, T., Westendorp, R., & Andersen, Z. J. (2022). Long-term exposure to road traffic noise and all-cause and cause-specific mortality: a Danish Nurse Cohort study. *Science of the Total Environment*, 820. <https://doi.org/10.1016/j.scitotenv.2022.153057>
- Cooley, S., & Schoeman, D. (2023). *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.*
- Erbe, C., Dent, M., Gannon, W., McCauley, R., Romer, H., Southall, B., Stansbury, A., Stoeger, A., & Thomas, J. (n.d.). *The Effects of Noise on Animals.* In *Exploring Animal Behaviour Through Sound* (2022nd ed., Vol. 1).
- European Commission. (2021). *Assessment of potential health benefits of noise abatement measures in the EU: Phenomena project.*
- European Commission. (2023). *Environmental Noise Directive.*
- European Environmental Agency. (2019). *Environmental justice, environmental hazards and the vulnerable in European society.*
- European Environmental Agency (EEA). (2021, December 10). *Exposure of Europe's population to environmental noise.*
- European Environmental Bureau. (n.d.). *Noise Pollution.* European Environmental Bureau.
- European Public Health Alliance (EPHA). (2023). *The Heavy Duty Vehicle CO2 Emissions Standards.*
- Iungman, T., Khomenko, S., Nieuwenhuijsen, M., Barboza, E. P., Ambròs, A., Padilla, C. M., & Mueller, N. (2021). The impact of urban and transport planning on health: Assessment of the attributable mortality burden in Madrid and Barcelona and its distribution by socioeconomic status. *Environmental Research*, 196, 110988. <https://doi.org/10.1016/J.ENVRES.2021.110988>
- Markandya, A., Sampedro, J., Smith, S. J., Van Dingenen, R., Pizarro-Irizar, C., Arto, I., & González-Eguino, M. (2018). Health co-benefits from air pollution and mitigation costs of the Paris Agreement: a modelling study. *The Lancet Planetary Health*, 2(3), e126–e133. [https://doi.org/10.1016/S2542-5196\(18\)30029-9](https://doi.org/10.1016/S2542-5196(18)30029-9)
- Phillips, J. N., Termondt, S. E., & Francis, C. D. (2021). Long-term noise pollution affects seedling recruitment and community composition, with negative effects persisting after removal. *Proceedings of the Royal Society B: Biological Sciences*, 288(1948). <https://doi.org/10.1098/rspb.2020.2906>
- Rösli, M. (2022). *More noise in the sustainability debate.* Swiss TPH.
- Starkey, P., & Hine, J. (2014). *Poverty and sustainable transport: How transport affects poor people with policy implications for poverty reduction - A literature review.*
- Taylor, M. S., Wheeler, B. W., White, M. P., Economou, T., & Osborne, N. J. (2015). Research note: Urban street tree density and antidepressant prescription rates—A cross-sectional study in London, UK. *Landscape and Urban Planning*, 136, 174–179. <https://doi.org/10.1016/J.LANDURBPLAN.2014.12.005>
- The Lancet Regional Health – Europe. (2023). *Noise pollution: more attention is needed.* The Lancet.
- Witze, A. (2021). *Racism is magnifying the deadly impact of rising city heat.*
- World Health Organization. (2016). *Urban green spaces and health.*
- World Health Organization. (2017). *Factsheet 2: Cities, Urban planning and health.*
- World Health Organization. (2018). *Environmental noise guidelines for European Region.* WHO Regional Office for Europe.



EUROPEAN PUBLIC HEALTH ALLIANCE (EPHA)

Rue de Trèves 49-51 | 1040 Brussels (BELGIUM) | +32 (0) 2 230 30 56

www.eph.org | epha@epha.org



Co-funded by
the Health Programme
of the European Union

The European Public Health Alliance has received funding under an operating grant from the European Union's EU4Health Programme (2021-2027). The content of this document represents the views of the authors only and is their sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the European Health and Digital Executive Agency (HaDEA) or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

Transparency Register Number: 18941013532-08