



# **NOISE POLLUTION IN THE UK**

RESEARCH AND RECOMMENDATIONS FOR LUND TRUST

Danielle Banks

1 September 2023

## Table of Contents

Introduction.....	2
Methodology .....	4
1. What are the main problems caused by noise pollution in the UK in terms of its effect on both health and nature?.....	5
Noise pollution and human health .....	5
Noise pollution and social inequality .....	7
Noise pollution and the environment.....	8
2. How are the UK and other countries responding to the problem of noise pollution? .....	11
Noise pollution caused by cars .....	12
Noise pollution caused by rail .....	14
Noise pollution caused by aircraft .....	16
Noise from neighbours.....	18
3. Who are the main ‘actors’ in the field of noise pollution?.....	21
4. How can philanthropy support the mitigation of noise pollution?.....	25
Combatting air and noise pollution .....	25
Combatting noise pollution and climate change.....	27
Mitigating noise pollution while conserving nature.....	28
Combatting noise pollution and minimising social inequality .....	30
Recommendations for Lund Trust.....	32
Conclusion.....	37
Bibliography.....	38

## Introduction

Noise pollution is defined as the unwanted or harmful sound made by people, including noise made by transport, industry, and domestic (recreational venue and neighbour noise) activity (Peris, 2020). The World Health Organisation (WHO) estimates that every year one million healthy years of life are lost to the effects of noise pollution. Further to this, it is responsible for over 10,000 premature deaths per year and in Europe more than 100 million people are exposed to harmful levels of noise. Noise pollution is currently considered the second most significant environmental cause of illness, after air pollution (Peris, 2020). Last year, a study by the Chartered Institute for Environmental Health found the number of complaints saying noise pollution had a “major impact” on respondents' lives from 89 UK local authorities rose by more than 50% (CIEH, 2022).

When measuring noise, the standard unit used is the decibel (dB) (Stanley, 2023). Decibels indicate how much air vibration makes up a sound, with more vibration resulting in a louder noise. For humans, the lowest we can hear is 0 dB and the threshold for pain is 90 dB. Decibels are not on a linear scale, and an increase of 10 dB represents a doubling of perceived noise levels.

<b>Decibel measure (dB)</b>	<b>Common Sound</b>
30	Leaves rustling / whisper
40 - 50	Average room noise
70	Vacuum cleaner
80	Inside an aeroplane or underground carriage
90	Hairdryer
110	Nightclub or Rock concert
135 - 150	Jet engine

*Table 1* Outlining the common sounds of increasing sound levels (dB) (House of Lords, 2023)

Cities tend to be the epicentre of noise pollution (McMullan, 2019). Most noise pollution is generated by transport (car, rail, and air travel) (Slabbekoorn, 2019). Other sources include industrial and construction sites and noise made by

domestic activities, i.e., neighbour noise or noise from venues such as pubs and clubs. As well as being a problem in cities, noise pollution is also prevalent in rural areas, with noise generated through agriculture and wind turbines. Oceans also suffer from noise pollution. Ships, oil drills, sonar devices, and seismic tests all generate large amounts of noise, which are much louder than the sources of noise on land and spread much further distances (Stanley, 2023).

To humans, the most common effect of noise pollution is hearing damage, but it has been found that exposure to loud noise can also result in high blood pressure, heart disease, sleep disturbance, and annoyance (Peris, 2020). These problems affect all age groups, but children seem to be the most vulnerable, with noise affecting their cognitive development. Noise pollution also impacts animals, who suffer similar physiological effects. Alongside this, animals also rely on sound for navigation, foraging, mating, and avoiding predation. Increasing noise pollution in their habitats interferes with this, making it hard for them to carry out these tasks, negatively affecting their survival. At sea, whales and dolphins are among the most affected by noise pollution as they rely on echolocation to communicate, navigate, feed, and find mates. Excess noise pollution not only interferes with their echolocation but can cause severe damage to the sensitive hearing of these marine mammals (Stanley, 2023)

## Methodology

This report explores the causes and consequences of noise pollution in the UK. My overarching aim in this report is to investigate what is being done to combat noise pollution and suggest how mitigation measures can be integrated into other environmental and social inequality projects across the UK. I will use four questions to structure my report. My research questions are:

1. What are the main problems caused by noise pollution in the UK in terms of its effect on both health and nature?
2. How are the UK and other countries responding to the problem of noise pollution?
3. Who are the current 'actors' in the field of noise pollution?
4. How can philanthropy support the mitigation of noise pollution?

To first understand the consequences of noise pollution, I present evidence from scientific papers outlining the impacts of noise pollution. I then look at the major sources of noise pollution in the UK and successful mitigation methods from other countries to gain a deeper understanding of what needs to be done. Then I examine the current organisations and charities working on noise pollution and include examples of where their work has been a success. Finally, I provide a series of recommendations on how to integrate mitigation methods for noise pollution into other environmental projects. This will allow Lund Trust to incorporate these ideas into its potential future work.

# 1. What are the main problems caused by noise pollution in the UK in terms of its effect on both health and nature?

## Noise pollution and human health

Most people are conscious of the health risks posed by pollution. As I cycle to work in the morning with fellow commuters, I note that many cyclists wear face masks to protect themselves from the particulates expelled by the crawling traffic. To tackle air pollution, the new Clean Air Strategy has proposed to ban the sale of diesel cars by 2040, reduce ammonia emissions from agriculture through investment and legislation, and reduce particulate emissions from domestic burning (DEFRA, 2019). In London, the mayor has introduced ULEZ to reduce traffic and clean up the air. Cars that fail to meet emissions standards will be charged £12.50 a day (TfL, 2023). Noise pollution is ranked as the second highest cause of ill health, after air pollution, yet the government currently has no legal limits for most sources of noise. The mayor's London noise strategy has not been updated since 2004 (Khan, 2023).

Noise pollution is a significant risk to health for many reasons. The most common result of excess noise is hearing damage. Exposure to continuous noise above 85 dB results in eventual loss of hearing caused by damage to the inner ear (Stansfield and Matheson, 2003). In everyday life, sound rarely reaches these levels. The average person is more likely to experience moderate noise at a constant level. This is less likely to cause physical damage but can cause chronic health problems. The World Health Organisation (WHO) has outlined the noise levels that threaten health (Coughlan, 2007) to be 50dB or above to cause heart issues, 42 dB to cause sleep disturbance, and 35 dB to cause annoyance. The threshold of noise estimated to impact children's cognition is 55 dB (Coughlan, 2007).

The most well-documented response to noise is annoyance. Annoyance is defined as a stress reaction that encompasses a wide range of negative feelings, including dissatisfaction, disturbance, distress, irritation, and nuisance (Peris, 2020). The European Environment Agency estimates that 22 million people across

Europe suffer from chronic high annoyance. Research has shown that annoyance can have cascading effects on health, negatively affecting sleep, the heart, and hormonal and metabolic health, and can lead to depression and anxiety (Beutel et al, 2015). As annoyance is a subjective experience, it depends not only on exposure levels but also on contextual and personal factors. Personal factors include an individual's sensitivity and attitude towards the noise emitters (Okokon, 2015). If someone has no control over the noise, annoyance will be higher and the effects on health will be greater. This is one of the reasons noise pollution has a disproportionate effect on individuals in lower socio-economic positions. I will consider this in more detail in the next section of this report.

Another well-studied effect of noise pollution is sleep disturbance. A study by Maschke et al (2004) on airports in Germany found the presence of sound levels as low as 48 dB caused people to wake up. Basner et al (2014) further demonstrated that even when sounds are not loud enough to wake you up, they still result in a stress response. People wake up feeling more tired, aware they had a bad night's sleep. The effects on sleep, like annoyance, are important due to the cascading effects on the rest of an individual's health.

Increased annoyance and disrupted sleep can cause heart and circulation problems. Loud, unwanted noise triggers the release of stress hormones, an evolutionary relic related to the fight or flight response (Coughlan, 2007). When stress hormones are in constant circulation, they result in long-term physiological damage that can be life-threatening. For example, the stress hormone cortisol damages blood vessels over time, increasing the risk of heart disease (Godwin, 2018). A study commissioned by the European Environment Agency estimates that environmental noise contributes to 48,000 new cases of heart disease every year within Europe (Peris, 2020). Another study, which examined those living around Schiphol Airport in Amsterdam, found that those living in proximity to the airport received significantly more medical treatment for heart trouble and high blood pressure than those further afield (Knipschild, 1977).

Noise pollution can cause similar medical issues in both children and adults, such as cardiovascular problems, hormonal imbalances, and sleep disturbance. However, when noise pollution is present in schools, it can also have a detrimental impact on cognitive skills, such as reading, memory, and attention (Stanfeld and Clark, 2015). A study by Hygge et al (2000) looked at the effects of the relocation

of Munich airport on ten-year-old children across two schools – one next to the old airport, School A, and another next to the new one, School B. Before the relocation, at the school next to the old airport, high noise exposure was associated with poor long-term memory and reading comprehension. Two years after the airport closed, the researchers revisited School A and found the cognitive deficits no longer present. At School B, however, next to the newly opened airport, the children had begun to show poor long-term memory and reading comprehension (Hygge et al 2000). Another study, looking at traffic noise in Barcelona, Spain found that children exposed to three times more traffic than other pupils had slower memory development (by 23%) and slower development of concentration skills (by 5%)

In the UK, a study conducted by Haines et al (2001) near Heathrow Airport found that noise pollution disproportionately affected children from lower socio-economic backgrounds. The study looked at 11-year-old students' SAT (Scholastic Aptitude Test) test scores in relation to aircraft noise exposure (Haines et al, 2001). It found that noise exposure was associated with worse performance on reading and maths tests. These effects were worse for students who lived in disadvantaged areas, where noise pollution was higher, and who already experienced lower levels of academic attainment than peers from higher socio-economic backgrounds.

## **Noise pollution and social inequality**

Noise pollution in the context of health outcomes is not a burden shared equally throughout the population. The negative health outcomes of noise pollution are not distributed equally throughout society. It is often those in lower socio-economic positions who are exposed to higher levels of noise pollution and thus feel its effects more strongly (Peris, 2020). This is because it is often society's poorest who live and work in the lowest quality environments. Areas close to busy roads, railways, and airports are often the most affordable option (Khan, 2023). Those with more money can choose quieter, more expensive areas and can relocate if noise becomes an issue, such as when a new flight path is established.

As well as poorer people living in noisy areas, poorer areas are noisier. Poorly maintained roads generate higher levels of noise. They also often have the least



available open green space. As vegetation acts as a natural sound barrier, even if poorer areas are not exposed to more noise, the residents' experience of it is greater (Khan, 2023).

It is not just noise from infrastructure that causes a risk to those in lower socio-economic positions. A MORI (Market and Opinion Research International) survey in 2003 showed that 20% of people with a household income of less than £17,500 regularly hear noise from neighbours. This includes 93% of social housing tenants. In contrast, only 12% of people with an income of more than £30,000 could hear noise from their neighbours. (Stewart et al, 2016).

Besides the greater presence of noise in poorer areas, individuals in lower socio-economic positions often suffer from worse health (Dreger et al, 2019). This is referred to as the socio-economic health gradient. This means that individuals in lower socio-economic positions suffer more from noise pollution. This is because they are exposed to higher levels of noise and are more vulnerable to the effects of noise due to poor health.

## **Noise pollution and the environment**

The natural world is full of sound. Abiotic sources include the weather or the rustling of leaves, while biotic sources include calls from birds, mammals, and amphibians, as well as the echolocation of whales and dolphins. (Slabbekoorn, 2019; McGregor and Horn, 2019). Human noise is much more intense than natural sources of sound. It contains much lower frequencies than natural sounds and is also made up of much more high-intensity sounds. Intense sounds are more likely to have acute impacts, including temporary or permanent injury to auditory systems. By contrast, continuous noise is more likely to produce chronic effects such as masking of communication between individual animals and stress (McGregor and Horn, 2019).

Noise pollution is known to affect all animal groups, with studies conducted on mammals, birds, amphibians, reptiles, fishes, and invertebrates (Sordello et al, 2020). Although intense noise can result in permanent hearing damage, and in some cases, death, this report will focus on the behavioural impacts of continuous noise, as these are more widespread. Four key mechanisms drive the behavioural effects of chronic noise exposure:

- Noise masks important sounds, including communication between individuals and other sounds, such as approaching danger;
- Noise distracts animals from extracting information from the environment;
- Noise can be perceived as a direct threat, thereby altering the behavioural responses of the animal;
- Noise can initiate states of chronic stress in animals.

Birds rely heavily on sound, making them the focus of many studies on the effects of noise pollution. The two main functions of bird song are to attract mates and defend territory. So, noise pollution can impact a bird's ability to reproduce. A study on great tits found that traffic noise harmed birds' reproductive success and reduced the number of chicks fledging the nest (Halfwerk et al, 2011). Although there was only a small difference for each bird during the breeding season, the impacts across an entire species over multiple years can be vast, resulting in a declining population (Halfwerk et al, 2011).

Not all birds are affected by noise pollution. A study by Perillo et al (2017) looked at urban parks and green spaces in Brazil. The study found that an increase in human noise led to a reduction in bird species in the area but not a reduction in the overall population number (Perillo et al, 2017). Another study found that noisy environments are favoured by certain species, possibly explaining the prevalence of some birds in urban environments (Francis et al, 2009). This shift in ecosystem composition is not only important for the organisms that are removed. Due to the highly interlinked nature of ecosystems, it has cascading effects for other species that we are not aware of. Although many studies look at just birds, research has shown that noise pollution has a universal impact on animals (Sordello et al, 2020; Kunc and Schmidt 2019). Scientists are calling for big shifts in noise pollution laws to protect the species that are suffering (Davis, 2019).

As mentioned earlier, marine and aquatic ecosystems also face the blight of noise (Davis, 2019). Ship engines, underwater blasts, sonar, and oil drilling are detrimental to marine life. Naval sonar devices produce some of the loudest underwater noise. Sonar is akin to the echolocation mechanisms of whales and dolphins. It can be as loud as 235 decibels and travel hundreds of miles underwater, interfering with whales' ability to use echolocation (Davis, 2019).

In the UK, the harbour porpoise is frequently exposed to shipping vessels as loud as 100 dB (Wisniewski et al, 2018). Porpoises use echolocation to detect their prey, but the sound from shipping vessels interrupts their foraging and stops them from using echolocation. As porpoises have high metabolic requirements, they need to feed continuously. This disruption to their foraging can have a significant impact on their survival, as they can only survive a few days without food (Wisniewski et al, 2018). The risks from noise pollution combined with pressures from fishing vessels and marine pollution mean that harbour porpoise populations are declining fast.

## 2. How are the UK and other countries responding to the problem of noise pollution?

Cities tend to be the largest cause for concern in terms of noise pollution, with the main sources of noise pollution being transport, industry, and domestic activities (Peris, 2020). Already regarded as a problem in the academic disciplines of healthcare and ecology, recently there has been more recognition of the risks of noise pollution to health and nature from the media (e.g., Khan 2023), the UK government (House of Lords, 2023), and international governments (Peris, 2020). The main catalyst for the increased recognition of noise pollution is arguably a report commissioned by the World Health Organisation on the health consequences of noise pollution in Europe (WHO, 2018).

Compared to its European counterparts, there is sparse legislation on noise pollution in the UK. The UK government produced action plans in 2019 for car, rail, and agglomerations, but they include recommendations rather than requirements or strict rules. Promisingly, this year the House of Lords produced a report calling for more action and research to combat noise pollution (House of Lords, 2023). However, the UK still seems to be lacking in terms of action taken on noise. Although we are not the worst offender in Europe, many other countries are taking noise pollution more seriously and implementing measures to combat it.

The relative lack of action taken by the UK is likely a combination of underfunding by the government and the decision to leave the European Union (EU). Noise pollution seems to be an issue the EU is keen to address through both legislation and funding. Before Brexit, the EU was responsible for the majority of UK legislation on noise, and most has yet to be replaced.

Through a series of examples, I will highlight some of the areas in which noise pollution has been causing problems in the UK. I will also give examples of successful noise abatement strategies from other countries to highlight some methods of noise mitigation. The following sections consider:

1. Noise pollution caused by cars.
2. Noise pollution caused by aircraft.
3. Noise pollution caused by rail.

4. Noise pollution caused by neighbours and domestic activities.

## **Noise pollution caused by cars**

The number of people exposed to noise from road traffic far exceeds those exposed to noise from rail, aircraft, and industry. Approximately 113 million people in Europe are affected by road traffic noise of at least 55 dB in urban areas, which the World Health Organisation defines as a level of noise that results in health problems (Peris 2020). In most European countries, more than 50% of city inhabitants are exposed to road noise at such harmful levels. In London, over 1.6 million people are exposed to daytime traffic noise louder than 55 dB (Peris, 2020).

To combat road traffic noise, the UK government's Noise Action Plan details several possible approaches, with controlling noise at the source (i.e. the vehicles) the priority (DEFRA, 2019). Noise from vehicles is controlled by legal limits and it is illegal to modify your car to make more noise (Government UK, 2015, Government UK, 2022). Where it is not possible to control noise at the source, Highways England runs a scheme under which individuals can apply for funding to noise-proof their homes, for example with double glazing (Highways England, 2022). This scheme is a step in the right direction, yet, despite a thorough search of online material, I could not find any examples where noise mitigation was central to a road's design. Further evidence demonstrating a lack of prioritisation, is shown on the government's website, where it says, "there's no legal limit to road noise although noise levels might be taken into account when new roads or houses and offices near roads are planned". The uncertain language used here suggests that the government understands the problem of noise, but it is currently not high enough on the agenda for it to fund or implement any further policies or schemes directly related to noise.

### **Case Study 1: Monza, Italy**

One example of where noise pollution from traffic has been explicitly addressed is in Monza, Italy (EEA, 2022). Located in the region of Lombardy, Monza had an issue with noise. This was because of the many street crossings

causing vehicles to constantly stop and start. Noise was also an issue at night because, although they stopped and started less frequently, vehicles were traveling at higher speeds. To address this, the city created a Noise Low Emission Zone (LEZ) in which it implemented a series of top-down and bottom-up measures. Importantly, the city carried out consultations with the community before and after the implementations to gather feedback on the success of the measures.

Top-down measures included infrastructure changes, such as replacing the road surface with a low-noise surface and protecting pedestrian crossings, and road traffic management measures, such as restricting the passage of heavy vehicles (EEA, 2022). Bottom-up measures included community participation, such as educational and awareness-raising activities in local schools, and the use of a scheme to encourage students and parents to walk to school.

Noise levels during the day were reduced by about 2dB, and during the evening and night by 5-6Db (EEA, 2022). The percentage of people exposed to noise levels higher than 65dB in the LEZ decreased from 9.6% to 6.7%, while the percentage of people exposed to values higher than 55dB decreased from 12.8% to 4.7%. As part of the consultations with the community, the city conducted semi-structured interviews with experts involved in implementing the project. Those interviewed considered low-noise emission asphalt repaving the most effective measure for noise reduction. They noted that when traffic is relatively fluid and consists of light vehicles only, as at night, the noise reduction was greatest. During the daytime, when traffic is not fluid because of traffic lights, the low-noise asphalt road surface was less effective. They also noted that the protected pedestrian crossings improved social relationships and liveability in the neighbourhood.

The above example demonstrates that when a scheme focuses on a specific area of high concern and consults and considers the needs of the local community, it results in the most successful outcomes. This can be partly attributed to the fact that noise annoyance is based on both perception and the noise itself (Peris, 2020). Therefore, attempts to address noise which put the

people who live there first result in improved feelings of satisfaction resulting in less annoyance. Such measures would work best when aimed at combatting traffic noise next to schools or densely populated neighbourhoods. There have been no parallel schemes that I could find trialled in the UK centred around noise pollution. One could imagine how beneficial a similar approach could be to communities that have busy roads cutting through them.

## **Noise pollution caused by rail**

Rail traffic noise is the second most dominant source of noise pollution in Europe, with 22 million people estimated to be exposed to noise of at least 55 dB throughout the day and night. In London, noise from rail (including underground services) is particularly pervasive. People who travel by underground trains or live close to the tracks make high numbers of complaints (BBC, 2023). Between January 2020 and August 2022, Transport for London received 1,341 noise complaints. Some complainants registered noises close to 60 dB, equivalent to a vacuum cleaner in the same room, from living next to tracks. On the underground, passengers are often exposed to noise levels exceeding 80 decibels, and on some trains over 100 decibels. Transport for London states that noise of 80–100 decibels is 'hazardous' and levels over 100 decibels are 'highly hazardous' (BBC, 2023).

Similar to that for road traffic noise, control of noise at the source is listed as a priority in the 2019 Rail Action Noise Plan. It also says noise created by new railway vehicles is to be controlled through EU legislation. However, the UK government website says, "there are no legal limits to noise from existing railways" and directs those wishing to find out more to a non-functioning page on the National Rail website. The UK government recognises that railway operations can give rise to a degree of unavoidable noise and disturbance. The government website on rail noise states that noise and disturbance are unavoidable but "the operator must demonstrate they have used reasonable diligence to control noise or vibration". There does not appear to be any external tests or controls to ensure this "reasonable diligence" is carried out by train operators, so it is down to them how to interpret this. Leaving only the rail provider to deal with the noise created is likely to result in the breaching of recommendations in some cases.

Despite a lack of concrete rules, noise pollution from rail does currently seem to be a consideration in the planning of the new railway High Speed 2 (HS2). It recently came to light that some sections would exceed the World Health Organisation's guidelines of a maximum of 44 dB at night to avoid adverse effects on sleep (Telegraph, 2019). For more rural homes and farms, it would breach the limits both late at night and early in the morning. To prevent this, it is proposed that the company may have to install barriers and tunnels to contain the sound. However, without adequate UK legislation, it may be that some areas are exposed to levels over the recommended limits. Further problems from HS2 come from the construction itself. Residents in Euston, a proposed major hub for the new railway, have been suffering due to the noise generated by construction (Taylor, 2021). Although residents were promised to be provided with sound insulation, not all eligible households have received this, and there are long delays in installation. This has led to residents in nearby estates suffering from sleep disturbance or even avoiding spending time in their own homes (Taylor, 2021). Council data demonstrated only 13% of noise mitigation works, such as extra glazing to homes, have been completed (Taylor, 2021). HS2 disputes these figures and says 55% of this noise insulation work has been completed. This example highlights that reasonable diligence is not strong enough to control the activity of private companies in generating noise. Instead, noise has to be pushed to the forefront of their agendas, which is most effectively done through legislation.

### **Case Study 2: Rail in Switzerland**

Switzerland is currently working on the expansion of its rail networks and has placed the mitigation of noise pollution at the heart of the expansion (Änderung, 2016). It was a long-term aim in Switzerland to halve noise emissions from the domestic rail network by 2020. Works on achieving this began as early as 2000, and in 2015 were able to convert 9,500 freight wagons with quieter composite breaks. Between 2000 and 2015, this renovation cost a total of 206 million pounds and was financed by the federal government. At a speed of 80 km/h at 7.5 metres, old freight wagons with cast iron brake pads generate noise pollution of 92 decibels (dB). In the case of composite brake blocks, 81 dB is achieved, which corresponds to a halving of the noise level produced by the trains.



For the period from 2016 to 2025, the Swiss Government has budgeted investment aid of 27 million pounds (Änderung , 2016). This will allow for the replacement of older trains with low-noise freight wagons. This sum can be used to procure around 500 new, particularly low-noise freight wagons. Alongside this, more research is being done on how to reduce noise from other sources such as the railway itself. The federal government is providing a total of eighteen million pounds for research into railway noise until 2025. For example, the Department of Acoustics at the Empa Research Institute in Dübendorf is working together with the Technical Universities (TU) of Berlin and Munich on a model for calculating the amount of sound generated by the interaction of wagon material and infrastructure. The aim is to develop a simulation model for low-noise track constructions – an area in which the Swiss Federal Railways are also active.

This example, although not exactly parallel to the problem of rail in the UK, highlights the benefits of setting clear goals and pushing noise to the forefront of plans, unlike what is happening with HS2. Although ambitious, the Swiss government was able to develop its infrastructure without the cost to people living near railways. Although the Swiss government achieved this through investment, a similar result could be achieved by legislation that provides private rail networks in the UK with deadlines to update their old and noisy rail technology.

## **Noise pollution caused by aircraft**

Air traffic noise affects a much smaller proportion of the population than road or rail traffic noise. According to the European Environment Agency, it is estimated that aircraft noise exposes approximately 3 million people to levels of 55 dB or higher during the daytime (Peris, 2020).

Noise is regulated to some extent at all UK airports. Mitigation measures usually include noise limits and restrictions on night flights. Between 11:30 pm and 6 am, only sixteen flights are allowed by law (but this number does vary occasionally) (HACAN, 2018). Furthermore, legislation dictates that flight paths should be designed to avoid the most populated areas.

One example that highlights the need for tighter rules and regulations regarding noise pollution comes from residents in East London. Residents there bear the brunt of the growth of both Heathrow and London City Airport (HACAN East, 2023). London City Airport opened in 1987 as a business airport with a few quieter and smaller planes. However, it now operates as a full-scale commercial airport. In the last five years, it has been granted permission for a 50% increase in the number of flights, capping them at 110,000 per year. The increase in flights to and from London City Airport is combined with flights on the path to Heathrow, meaning that noise levels on the ground exceed 87 dB regularly (Evening Standard, 2012). The airport's busiest times are around 7:15 – 10:00 am and 4:30 – 8:30 pm. The airport recently sought to extend its operating hours, with more flights on Saturdays and every morning between 6:30 and 7:00 am (HACAN East, 2023). Newham Council overruled the decision, but this does not mean the airport will not try to increase its operating hours again in future.

### **Case Study 3: Frankfurt Airport**

Frankfurt Airport is one of the busiest airports in the world and a pioneer in noise abatement measurements (Fraport, 2022). Even as Frankfurt airport continues to grow, the noise level shrinks. From 2003 to 2013 there was a noise reduction of 8% per flight and a 17% reduction in noise per passenger (a metric that is calculated by looking at noise created by the airport divided by total passenger number, allowing for the effect of varying flight numbers from year to year) (Alonso et al 2017). The main way mitigation is achieved is through increased operational efficiency. Increased efficiency of airport management allows planes to climb to higher altitudes at steeper gradients and initiate continuous climb and descent operations, which reduce noise by minimising the time planes are close to the ground (Alonso et al 2017). Alongside this, the airport has introduced measures to encourage airlines to reduce the noise of the planes. Frankfurt Airport was the first to take account of noise pollution when considering take-off and landing fees (Alonso et al 2017). This provides financial encouragement for airlines to reduce the noise pollution caused by their planes. Lufthansa Airlines, at Frankfurt airport, placed acoustic panels at engine inlets which reduces the aircraft noise both during take-off and landing.

Although Frankfurt airport is leading in the reduction of noise, it is by no means perfect. There are many pressure groups from residents resisting the expansion of the airport and calling for tighter regulations (Bartsch, 2011). The lack of development in reducing noise pollution from airports and airlines is likely a combination of the vast economic benefits they provide combined with lack of legislation to control the actions of private companies. Furthermore, due to the noisy nature of jet engines, mitigation measures only reduce noise pollution by small amounts. One glint on the horizon is the development of hydrogen planes, which produce about the same amount of noise as an internal combustion engine in a car (O’Callaghan, 2022) (more information on this in Section 4).

This example highlights that when noise pollution is a central concern for an airport’s operations, small improvements can lead to larger overall decreases in noise. However, airports are a tricky source of noise pollution to manage. There must be a trade-off between the economic benefits they provide and the costs of noise pollution they create.

## **Noise from neighbours**

Although not included in the World Health Organisation’s report on noise pollution, probably because it is difficult to quantify, noise from neighbours is a considerable problem in both the UK and the rest of Europe. In the UK, around one in four people report problems with noisy neighbours (Eurostat, 2021). The problem was particularly exacerbated during the COVID pandemic lockdowns when such complaints rose by 67% (Tong et al, 2021). Despite the figures demonstrating this to be a national problem in the UK, the government portrays this as a local issue, relinquishing responsibility to local authorities (Government UK, 2023). The government dictates that councils must investigate complaints about noise that could be a ‘statutory nuisance’ (covered by the Environmental Protection Act 1990). For noise to count as a statutory nuisance, it must do one of the following:

- Unreasonably and substantially interfere with the use or enjoyment of a home or other premises.
- Injure health or be likely to injure health.

If they agree that a statutory nuisance is occurring or will happen in the future, councils must serve an abatement notice (Morton, 2023), which requires whoever is responsible to stop or restrict the noise. However, a lack of funding from the government, combined with an increase in noise complaints since COVID-19, has resulted in many councils being unable to deal with noise complaints to a satisfactory level (Morton, 2023). Furthermore, not everyone experiencing problems from neighbour noise feels able to report it. Fear of repercussions or inadequate support from local authorities results in neighbour noise becoming an accepted part of some people's lives.

Recently, the Local Government and Social Care Ombudsman reported that councils are "frequently failing" to use their powers to tackle anti-social behaviour (Morton, 2023). In one case, a resident complained to the council about a neighbour's party with loud music that lasted more than 13 hours. Despite another party a few weeks later, he was told by the council that it would only consider acting if he recorded six incidents within 25 days. The report from the ombudsman demonstrates allocating responsibility for adjudicating noise complaints to local authorities is not a successful strategy in the UK.

#### **Case Study 4: Quiet hours in Switzerland**

Quiet is an integral part of Swiss culture (Homegate, 2021). Although this varies slightly from region to region, quiet hours are generally defined as:

1. Midday quiet hour: weekdays between 12 noon and 1 pm.
2. Nighttime quiet hours: 8 pm or 10 pm to 6 am or 7 am.
3. Sundays and public holidays: all day.

The noise regulations are defined in legal codes, though are rather vague. The law does not specify what a reasonable amount of noise is or what point noise levels become inconsiderate. A few examples of what you should not be doing in quiet hours include but are not limited to:

- Noisy household tasks.
- Constantly playing loud music.
- Mowing the lawn.

- Loud arguments or slamming doors during the night.
- Taking a bath at night.

Usually, noise disputes are settled amicably by neighbours, but, if a noise complaint fails to be resolved, a complaint can be submitted to the property manager. In the case of tenants, if they feel neighbours are disturbing them they can rely on tenancy law. The tenant can request the problem be rectified (or take legal action to have the problem rectified). Tenants are also able to demand a reduction in rent. Similar rules even apply when the noise is not coming from the same building, such as in the case of noise from nearby bars or clubs. People can lodge complaints under the law concerning the respective interests of neighbours and commit to observing the specified quiet hours (Swiss Civil Code, Article 684f., on the interests of neighbours) (Zulliger, 2021).

Although the quiet hours in Switzerland are an extreme alternative to what we have currently in the UK, the presence of these regulations, which everyone is aware of and educated about, creates a culture of not only quiet but respect. It gives people in Switzerland the power to know they can make a difference when they are suffering from noise. The UK could follow suit by making noise from neighbours a national issue and educating those suffering from it on how to proceed.

### **Conclusion**

This section not only serves to highlight areas in which the UK falls short in addressing noise pollution, but also aims to highlight the proactive measures undertaken by certain countries to mitigate noise. It is worth noting that the European Union has been advocating for heightened attention to noise pollution among its member states, alongside providing online resources. Nonetheless, the decision to exit the European Union is not justification for the lack of substantial measures to address noise pollution in the UK. The Welsh government's prioritisation of noise pollution, as evidenced by its integration of noise mitigation strategies within broader environmental solutions, exemplifies the possibility for a national strategy where there is a will to enact one (Welsh Government, 2023). (For further details, please refer to Section 4).

### 3. Who are the main 'actors' in the field of noise pollution?

The UK lacks the legislation to combat noise pollution. To address this shortcoming, a handful of organisations are working on the issue, most of which are small, local groups. The majority of these groups work on noise from airports. Other groups protest development or construction, or tackle noise pollution on a more general front. All share the common aim to spread awareness and influence government legislation. Here, I provide a brief overview of some of the charities working on noise pollution in the UK. This will help guide my recommendations for Lund Trust in the final section of this report.

#### **Noise Abatement Society**

The Noise Abatement Society is a UK company with the charitable aim of raising awareness and seeking solutions to noise pollution (Noise Abatement Society, 2023). John Connell established the Noise Abatement Society in 1959. He then successfully lobbied to get the Noise Abatement Act passed by Parliament in 1960. One of its more recent projects is the 'Sounding Brighton' project, which it is delivering in partnership with Brighton and Hove City Council and the University of Sussex (Lavia et al, 2012). Sounding Brighton looks at urban planning to address noise pollution by introducing positive sounds while minimising intrusive and unwanted noise. A part of the project, termed 'West Street Story', was a pilot scheme in Brighton's clubbing district that reduced incidents of anti-social behaviour and associated noise level complaints. This project is interesting as it pushes the important idea of 'soundscapes'. When tackling noise pollution, some believe it matters what sounds are not there and are there (Lavia et al, 2012).

#### **UK Noise Association**

The UK Noise Association is a voluntary, not-for-profit campaigning organisation that focuses solely on the effects of noise on health and annoyance. Its main role is to serve as a source of information for those seeking support (UK Noise Association, 2023). It produces publications that highlight the problems caused by noise and offer advice to those suffering from noise pollution. It also provides links to other companies and groups that offer solutions to those affected by noise

pollution. In the past, the organisation carried out local education initiatives to help those suffering from neighbour noise (Stewart, in pers. comms). Due to a lack of funding, it is not as active as it has been previously but is still a key player in noise mitigation.

### **The Centre for Hearing and Communication**

The Centre for Hearing and Communication is a US-based organisation that holds an annual International Noise Awareness Day campaign. It created the campaign to raise awareness about the harmful effects of noise on hearing, health, and quality of life (International Noise Awareness Day, 2023). Although it is a US-based charity, it has a global outreach. 24 April 2024 will mark the organisation's 29th annual event. It works with organisations such as the World Health Organisation and Centre for Disease Control, as well as universities and research facilities. It has received some media attention, but I believe it needs to push for greater publicity for its campaign to achieve the impact it deserves. To increase impact, more funding may be required. Alternatively, Lund Trust could encourage other organisations or charities with greater outreach to recognise this day as well.

### **Quiet Parks International**

Quiet Parks International (QPI) is a non-profit organisation committed to “saving quiet for the benefit of all life” (Quiet Parks International, 2023). The organisation aims to reduce noise pollution by placing an emphasis on the benefits of quiet to both humans and nature. It also educates the public on the negative impacts of noise pollution, but its emphasis on quiet makes this organisation stand out. The main way it does this is through offering a QPI award, which can be awarded to wilderness parks, urban parks, and trails. It also offers awards to conservation areas at risk of noise pollution, and it is currently working on an award for marine parks. A QPI award has several benefits, including increased recognition of the location and educating locals on the benefits of quiet. Quiet Parks International also supports the maintenance of quiet by offering its expertise to create park guidelines and management practices. Hampstead Heath, London, was recently awarded an Urban Quiet Place award, the first in Europe. In response, there have been several reports from big-name media outlets , including CNN and The Guardian (Lewis, 2021; Moshakis, 2022).

### **HACAN & HACAN East**

HACAN – the Heathrow Association for the Control of Aircraft Noise – is a campaigning organisation (HACAN 2023, HACAN East, 2023). It was formed in the 1970s to give a voice to residents under the Heathrow flight paths. HACAN campaigns for no third runway, a longer night-time flight ban, an end to all-day flying to provide communities respite, and improved operational practices. HACAN East is the sister group to HACAN, representing communities in East and South-east London. HACAN East is primarily focused on the impact of London City Airport and its potential expansion. It also take an interest in the flight paths that cross East and South-east London on their way to Heathrow.

The organisations listed above do not cover all the actors working on noise pollution in the UK, but do capture most of the key players. Despite the overwhelming evidence demonstrating the adverse effects of noise pollution on both human health and nature, there are relatively few charities that work on the issue. There are many charities where noise pollution could fit into their current remit – especially charities concerned with wildlife conservation – but most lack any specific campaigns. This may be because they focus on what is seen as a higher priority (especially in current times of inflationary pressures), such as land degradation, habitat loss and fragmentation, and climate change. It may also be due to a lack of public interest in the issue. If charities are unable to focus specifically on noise pollution, they could instead include it as a factor in campaigns on other issues. This approach can be particularly effective when a group of organisations work on a common cause. The campaign against the third runway at Heathrow is an example of a successful campaign of this nature.

#### **Case study 5: The expansion of Heathrow Airport**

In early December 2006, the Department of Transport published a report confirming its wish to expand Heathrow Airport beyond its original two runways (Dunn, 2019). The Labour government in power at the time supported the plan. In 2010, the expansion of Heathrow was cancelled by the new Conservative-Liberal Democrat government (BBC, 2010). Then, in July 2015, the Airports Commission recommended a third runway with an additional terminal. This plan would increase flights by 740,000 per year. In June 2018, the House of Commons voted in favour of the third runway (UK Government 2018).



From the start, many groups protested the proposed expansion (Brown, 2007). This included groups that were set up primarily to stop airport expansion (eg, HACAN and HACAN East), wildlife charities (RSPB, National Trust, WWF), climate charities (Green Peace, Friends of the Earth), and development charities (Oxfam and Christian Aid). The campaigners used a range of methods to raise awareness of the issues surrounding the proposed third runway and prevent it from being built. Objections from environmental organisations focused on the increased CO<sub>2</sub> emissions caused by the additional flights that would add to global warming (Benjamin, 2007). Local communities were concerned that the airport's expansion would destroy villages and homes (Ryan, 2006). The communities would also be significantly affected by noise pollution, as the third runway would expose hundreds of thousands of residents in London and Berkshire to sustained high levels of noise from aircraft (Crerar, 2007).

In February 2020, because of the protests and campaigns, the Supreme Court deemed the expansion of the third runway to be illegal (Carrington, 2020). It made this decision because ministers had failed to consider the UK's commitments under the 2015 Paris Climate Accord, which requires keeping global temperature rise as close to 1.5C as possible. However, in December 2020, this ruling was overturned, meaning Heathrow is now able to seek planning permission (BBC, 2020). Although the future of the expansion is uncertain, the campaign received huge amounts of publicity. People who do not live near airports were made aware of the negative impacts airports can have. Although the campaign did not specifically focus on noise pollution, it demonstrated an effective approach to tackling the issue. It incorporated noise pollution into a campaign where the source of the noise was responsible for other environmental and inequality issues. This multi-faceted approach is particularly effective as it requires a number of organisations with different specialisms to collaborate against a common threat.

## 4. How can philanthropy support the mitigation of noise pollution?

Noise pollution adversely affects both human health and natural systems. However, only a handful of campaign groups work on noise pollution. Investing in these smaller groups may not have the most impact. We can instead learn from the success of the campaign against Heathrow's third runway, where a large array of organisations acted on a common interest. I propose in this section that the most effective way to counter the issue of noise pollution is to look at how multiple stressors can be addressed at once. This would allow noise pollution to be tackled by larger organisations with greater reach and impact, collaborating with smaller groups that may on their own require both more time and funding to achieve the same level of impact.

This section considers some of the ways noise pollution can be factored into other environmental and equality issues already being campaigned on.

### **Combatting air and noise pollution**

Air and noise pollution are interlinked. Vehicle exhaust pipes, tyres on the road, aircraft in flight, diesel trains and construction all generate both air and noise pollution, affecting those who live close to the source worst. There are many solutions that can reduce or remove both pollutants at the same time. The two examples below demonstrate this.

#### **Reducing the amount of traffic**

ULEZ (ultra-low emission zone) is a strategy implemented by the Mayor of London to address the problem of air pollution in the Greater London area (BBC, 2022). If a vehicle is too polluting and fails to meet the ULEZ emission standard, the owner must pay a £12.50 daily charge to drive within the zone, which now covers all 33 boroughs of Greater London. London City Hall estimates extending ULEZ will reduce the number of the most polluting cars on London's roads by between 20,000 and 40,000 a day (BBC, 2022). ULEZ is designed to discourage people from buying or driving more polluting cars, but also to encourage those who drive to

take public transport. Transport for London will reinvest the funds raised by ULEZ into improving public transport (TfL, 2023).

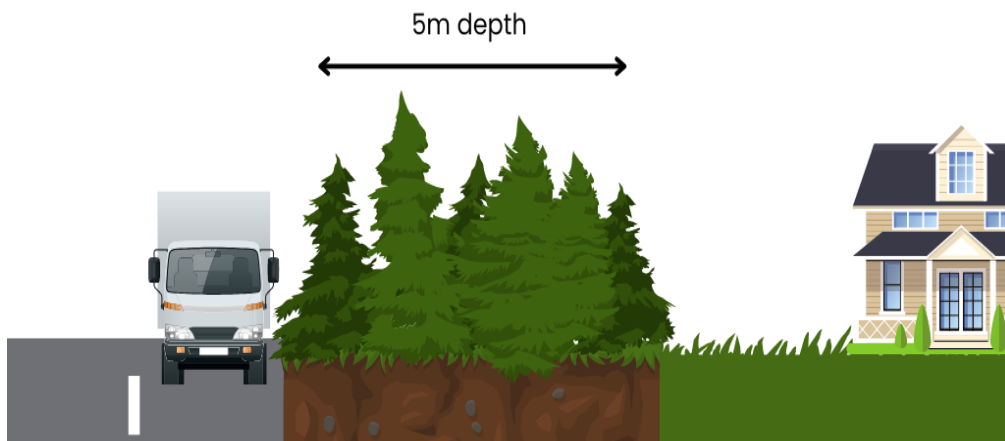
To reduce noise pollution, the scheme must reduce the number of vehicles on the road and increase the use of public transport. This is because if drivers were to simply switch to electric vehicles instead, there would be very little change in noise pollution. Electric vehicles overall do not produce less noise, as at speeds above 20 mph the main source of noise from vehicles is road-tyre friction (Peris, 2020). Therefore, this strategy will only be successful in reducing noise pollution if London City Hall follows through on its plans to increase investment in public transport.

### **Vegetation barriers**

The use of barriers made up of vegetation is a proposed solution to deal with air pollution in heavily polluted cities. It has been shown that leaves and needles on trees filter air pollutants and reduce exposure to hazardous substances in the air. In 2015, the iTree urban forest survey quantified the role London's trees have in improving air quality (Percharz et al, 2015). It found that London's trees remove 299 tonnes of PM10 (particulate) and 698 tonnes of NO2 pollution across London annually. However, planting trees to reduce air pollution needs careful consideration. Coniferous vegetation is often most effective as it offers year-wide protection, and barriers are most effective when planted at 2m with foliage coverage from the ground up (Barwise and Kumar, 2020). Open streets are often the best place to use vegetation barriers against air pollution, as when used down canon streets (streets with tall buildings on either side), it is likely to worsen air pollution by trapping it in the street (Barwise and Kumar, 2019).

As well as preventing air pollution, vegetation barriers have also been found to be successful noise barriers. When it comes to noise, barriers with dense foliage from the ground level up are the best strategy for reducing noise. A study by Ow and Ghosh (2017) found that road traffic noise could be reduced by as much as 50% by vegetation barriers. The most significant reduction occurs when vegetation is planted at a 5m depth (over double the amount required for air pollution), which would be unsuitable for most cities but may be possible alongside large roads or around schools or housing estates. This example illustrates that careful planning

is necessary to ensure mitigation measures have the largest impact on addressing both pollutants.



*Figure 1* demonstrating the optimal planting scheme for a vegetation barrier against noise pollution.

## **Combatting noise pollution and climate change**

Although there are other examples of how mitigating climate change can have a positive effect on noise pollution, for this section I have decided to focus on the commercial flight industry. This is because airports are a huge source of noise and the protests against Heathrow's third runway are an example of the success of combining the two issues. Furthermore, the two examples below (flight reduction and alternative fuel technologies) need no extra considerations to tackle noise pollution and climate change simultaneously. Instead, what is needed is a greater recognition of the positive effects strategies such as these could have on noise pollution.

### **Frequent flyer tax**

A report commissioned by the Committee on Climate Change in 2019 found that around 15% of the UK's population takes 70% of all flights and that 56% of the population has not flown anywhere since 2012 (Walawalker, 2019). The aviation industry, at present, accounts for around 2% of CO<sub>2</sub> emissions globally, but this figure is rising much faster than expected. The report predicted that the aviation industry is expected to become the biggest source of greenhouse gas emissions by 2050 (Walawalker, 2019). It recommends stopping frequent flyer programs as

these incentivise people to fly more (Walawalker, 2019). The report also recommends introducing an air mile levy that travellers would pay after clocking up a certain distance. Reducing the number of people flying, and therefore the total number of flights, could also reduce the expansion of airports, benefitting the climate and reducing noise pollution.

### **Hydrogen planes**

Another solution to the climate and noise issues of the aviation industry is the possibility of hydrogen-powered planes (O'Callaghan, 2020). Hydrogen planes would not emit any greenhouse gases and only emit water. Alongside being zero-emission, hydrogen planes are much more efficient than regular aircraft and produce far less noise. Researchers from a Spanish hydrogen plane company, HEAVEN, predicted that a plane would produce a noise like the internal combustion engine of a car, much quieter than traditionally fuelled planes (O'Callaghan, 2020). However, as these hydrogen planes are still in their infancy, more work is needed to understand the extent of noise reduction these planes could make.

### **Mitigating noise pollution while conserving nature**

The previous two sections demonstrate how we can mitigate the detrimental effects of noise on human health. As outlined earlier in my report, the effects of noise are not only restricted to our species. The effects of noise on nature can be tackled in the same multi-faceted way through the greater consideration of noise in conservation projects. Conservation is a useful and widely used tool in the face of biodiversity loss. In the protection of marine mammals, noise pollution in the oceans is widely campaigned against and publicised (for example, Whale & Dolphin Conservation UK, 2023; OceanCare, 2023; NHS, 2022). However, in the conservation of terrestrial organisms, noise pollution is rarely considered a threat to mitigate against. Nonetheless, it would not be difficult for terrestrial conservation projects to help to reduce the effects of noise pollution. Below I outline how this could be implemented in the context of nature reserves and creating new green spaces.

### **Protecting and creating quiet areas in nature**

Protecting areas that are not yet affected by noise pollution, so-called 'quiet areas', can bring significant environmental benefits (Nugent, 2016). Usually, these quiet areas are already protected in the form of nature reserves. Nature reserves are a long-standing method of mitigating biodiversity loss by providing a refuge for certain plants, animals, or specific ecosystems (The Wildlife Trusts, 2023). Recently, Natural England has laid out plans to establish a new 'super nature reserve', spanning large parts of Somerset and encapsulating a wide range of ecosystems. This nature reserve joins together six existing nature reserves and other managed land in the Somerset Levels, coast, and moors (Natural England, 2022).

Protected areas have the benefit of shielding organisms from noise pollution whilst also providing significant health and well-being benefits for people (Nugent, 2016). In terms of the benefits to biodiversity, quiet areas increase the number of green corridors without disturbing sound sources. Furthermore, quiet areas also reduce the presence of vehicles in protected areas, a significant cause of mortality for organisms that have roads cutting through their habitat. Quiet areas, therefore, have the combined benefit of offering areas with reduced negative effects of noise (for example, less interruption of communication) and greater protection from human activities (Nugent, 2016). As well as being beneficial to biodiversity, quiet areas have benefits for residents and regular visitors. Studies show that quality of life increases as noise levels decrease and health-related quality of life is highest in quiet rural locations (Shepherd et al, 2013).

### **Establishing new green areas**

As well as protecting sites that already exist, another way governments and other organisations help protect wildlife is through the creation of new green spaces. In 2020, the UK government launched the Nature Recovery Network to restore protected sites and landscapes, to help provide at least 500,000 hectares of new wildlife-rich habitat, and to plant 180,000 ha of woodland across England (DEFRA, 2020). Creating new habitats helps to recover threatened animal and plant species and connect areas across a landscape. It can also benefit people by providing new green spaces that are more accessible to people in cities.

Creating new green spaces to minimise the effects of noise pollution is not a new concept (Jasper, 2018). In the 60s, in West Berlin, botanist Rudolph Kuhn advocated for the use of nature to “create metropolitan oases shielded from the surging noise”. Here Kuhn recognised the role of urban green spaces in shielding noise, creating “sonic refugia”, benefiting both people and organisms. Kuhn recommended that any discussion on the use of plants for noise abatement purposes should first consider already existing forms of urban nature before altering the landscape of any given space. Therefore, interventions should be unique to the space they are protecting. However, there are some general strategies that tackle noise pollution more effectively. For example, the ground can be modified to physically deflect the sound, as in Buitenschot Park near Amsterdam’s Schiphol airport, which included 150 ridges to deflect the low drone of aeroplanes landing and departing on the 5th runway (Jasper, 2018). Smaller strategies include planting specific species of trees that are most effective at absorbing noise. Li et al (2020) found that conifers or larch tree bark absorbed the highest amount of sound and were more likely to reach the high densities required to effectively block noise.

## **Combatting noise pollution and minimising social inequality**

As previously outlined in this report, noise pollution and social inequality are highly interlinked. Disadvantaged people are much more likely to live and work in areas with high levels of noise (Peris, 2020). Poor infrastructure and lack of green spaces can also contribute to the noise (Khan, 2023), which means efforts to improve these issues in disadvantaged areas could reduce both social inequality and noise pollution. In this section, I outline the benefits of green spaces again, but this time in the context of urban locations. I also outline how the development of new infrastructure should consider noise pollution.

### **Urban green spaces**

A study by The Countryside Charity (CPRE) found that though 6,500 green spaces have been created across the country since 2012, hardly any are in deprived areas, and the majority are in wealthy parts of the South-East (Horton, 2022). CPRE called on the government to “promise the equivalent of a national park for every neighbourhood”, giving local parks in urban areas the same protection of national

parks. Besides their biodiversity value, green spaces in deprived areas help the community. Studies have shown that more green space is linked to less stress in deprived communities (Thompson et al 2012), potentially mitigating the stress and annoyance created by noise pollution.

### **Community involvement in development**

Developments can create noise both during construction and by creating new areas that may make noise. Examples include the creation of new roads, railway lines, or flight paths. This can have benefits, such as increased visitor numbers and employment, but can also create more noise pollution. Lower-income individuals have less mobility than those with higher incomes. They cannot move away from a newly created noise source.

One recent example of the negative consequences of not consulting local communities over development is the Madison Square Garden Concert Sphere (StopMSGSphereLondon, 2023). The venue is planned to be in Stratford, East London, on a parcel of land between Stratford Station and the Olympic Park. Residents, councils, and an MP have long opposed the development over concerns that the arena would blight the area with light and noise pollution. Despite heavy opposition, the development has been approved and is now waiting for the final say from the Mayor of London. The site would create noise pollution during the three years of its construction and, once open, would attract hundreds of additional cars and 15,000 evening visitors to the quiet residential streets of Newham.

Creating such a large potential source of noise pollution when a considerable proportion of the local community (most of whom are unlikely to be able to afford tickets to attend the venue) oppose it, demonstrates the perfect example of what not to do. Instead, councils and governments should focus first on improving community infrastructure and green space rather than opting for the quick fix of large revenues from potentially life-altering developments.



## Recommendations for Lund Trust

To summarise, my previous sections have demonstrated that the problems caused by noise pollution are pervasive both in human health and the natural environment. Despite this, noise pollution is not really seen as an issue in the eyes of the public and the government. The four main issues surrounding noise pollution in the UK are:

1. Sparse UK legislation and government initiatives to tackle noise pollution.
2. Few charities are working on noise pollution (both large organisations and small campaign groups).
3. Noise pollution is not high on the public agenda.
4. The government is not doing enough to combat noise pollution.

My recommendations to Lund therefore are to try, when funding projects, to encourage larger charities (tackling broader issues) to work more with smaller charities (who focus on noise) to ensure noise is considered in their future projects. This recommendation is actionable because, as I outlined previously, there are many joint solutions to noise and other environmental stressors. To achieve these joint mitigation measures, Lund Trust will need to:

### **1. Identify and reach out to smaller charities working on noise pollution.**

Lund Trust should identify and reach out to charities working on noise pollution in the UK. These charities include but are not limited to; The Noise Abatement Society, the UK Noise Association, HACAN and HACAN East, and Stop MSG Sphere London. These charities are a mix of London-only and UK-wide. I recommend this as these charities are run by and composed of experts in the field of noise pollution, some of whom have often been working on solutions to noise for much of their lives. They are, therefore, an abundant source of knowledge. The one limitation of these charities is their size. Both in terms of their funding and number of people who work for them.

My first short-term recommendation to Lund Trust is to initially identify and reach out to the smaller charities working on noise. Through discussion with these organisations, Lund Trust should assess the current state of their funding. If the

charities are running low on funds and not at full operational capacity Lund Trust could decide whether a small grant could help rectify this.

## **2. Identify and reach out to larger charities working on environmental and inequality issues.**

The next step would be to identify larger charities tackling issues such as air pollution, climate change, and social inequality. I have outlined some of these in the table below (table 2). Lund Trust should then encourage these larger charities to include noise pollution mitigation in existing projects, through the joint-mitigation measures outlined above. This would be achieved through facilitating partnerships between the small-scale noise charities and the larger organisations, to ensure noise pollution is effectively considered in projects. In some cases, this may mean larger charities have to slightly modify projects or in other cases may just require them to be conscious of the noise mitigation benefits their projects already bring.

<b>UK Charity</b>	<b>Main Aims</b>	<b>Field</b>	<b>Noise Pollution</b>
RSPB	A charity that aims to protect habitats and species through science-led conservation.	Wildlife Conservation	Regularly establish protected areas that help shield birds and other organisms from noise.
BTO	Advance understanding of birds through the production of impartial science to inform people and protect birds.	Wildlife Conservation	Funding for science that could look at the effects of noise pollution – also spreading and publicising the effects of noise pollution to local birding organisations.
The Wildlife Trust's	To bring wildlife back by empowering people to take meaningful action	Community Development	Establishment of protected areas shielding organisms

	for nature whilst creating a sense of community.	and Wildlife Conservation	from noise. Creating urban green spaces in deprived areas and working with communities.
TCV	Deliver projects that help to solve multiple problems at the same time, to protect and establish green spaces whilst empowering others to connect.	Community Development and Wildlife Conservation	Education on the effects of noise pollution to local communities whilst establishing protected areas for organisms.
Woodland Trust	To create new and protect existing woodlands to protect nature and provide benefits to people and the environment.	Wildlife Conservation	Creation of protected areas shielding animals from noise.
Greenpeace UK	Campaigns to create a greener, healthier, and more peaceful planet – one that can sustain life for generations to come.	Climate Change Mitigation and Wildlife Conservation	Large charity that has power to educate and campaign for better legislation in noise pollution. Where their current campaigns already benefit noise pollution, publicise and be aware of these benefits.
Friends of the Earth	Largest grassroots environmental campaign group with local action groups in over 200 neighbourhoods. Aims to	Climate Change Mitigation	Work with local communities to educate and campaign on the

	create a local solution to the global climate crisis.		problems of noise pollution.
Trees for Cities	Works with local communities to revitalise forgotten spaces and create healthier environments through planting trees.	Community Development and Urban Greening	Currently working on a new project to improve air pollution in Tower Hamlets, London, consider how this project could also benefit noise pollution. Investigate the impacts of their previous urban greening projects on noise pollution.
New Economics Foundation	A think tank that campaigns and aims to create a new economy that works for people and within environmental limits.	Minimising Social Inequality and Climate Change Mitigation	Already campaigns to stop airport expansions. Publicise the positive effects this can have on noise pollution.
The Equality Trust	A charity that works to improve the quality of life in the UK by reducing economic and social inequality.	Minimising Social Inequality	Investigate how noise pollution affects people from different socio-economic backgrounds more.

*Table 2* A list of charities currently tackling environmental and social justice issues in the UK where noise pollution would fit well into their pre-existing work.

### **3. Spread the word on noise pollution.**

Finally, I recommend that Lund Trust works with both small and large organisations to fund campaigns to push noise pollution further into the public discourse. Noise pollution is a significant threat to human and wildlife health, however, as not all members of the public experience it or understand its effects, it is not considered to be a problem. Governments are often more likely to make changes and introduce legislation in problems that receive large-scale public and media support, for example, legislation to cut down on single-use plastics (Government UK, 2023). In this case, the movement was largely inspired by the Blue Planet series, which educated and created a movement spreading the dangers of ocean plastics (BBC, 2017), for both wildlife and human health (Parker, 2023). This shows how increased public education can influence legislation. The increased public awareness of the campaign against the Heathrow Third Runway was an important factor in its success. Therefore, when making grants for and supporting joint mitigation measures, Lund Trust should ensure the organisations place an emphasis on publicising their campaigns. In addition, education on the problems caused by noise pollution should be a priority.

This increased recognition would also encourage more research to quantify the costs of noise pollution. As I presented in the first section of my report, the World Health Organisation has outlined specific 'safe levels' of noise that when broken can lead to negative health impacts. It has been shown that in the UK we break many of these safe levels in many contexts of our daily lives. It is therefore reasonable to assume that these negative impacts have taken place, are taking place, and will take place in the future. If there is a monetary cost to breaking these levels, this should be of interest to the government. Therefore, further research to quantify the potential costs to the government may encourage more immediate action.

## Conclusion

There is no doubt noise pollution poses risks to both human health and the environment. The World Health Organisation predicts that in Europe alone a million years of healthy life is lost per year (Peris, 2020). Literature reviews on the effects of noise on animals have found that every species (where noise pollution has so far been studied) is affected (Sordello et al, 2022). Furthermore, the UK seems behind its European counterparts when it comes to legislation, relying on guidelines and recommendations instead of strict legal limits, as outlined in Section 2. This has led to some charities trying to push back and campaign for better legislation. Due to their small size and lack of funding, it is something they are struggling to do.

I believe we are still yet to understand the full effects of noise pollution. One reason for this is that noise pollution is often confounded with other stressors (air pollution, climate change, habitat degradation, social inequality, etc.). I propose this should be used to Lund Trust's advantage when deciding how best to fund solutions. Many of the solutions to noise pollution are already being acted out to solve other stressors. To maximise their efficacy, I recommend Lund Trust should facilitate and encourage cooperation between small charities working on noise pollution - noise experts - and larger organisations that focus on broader issues.

More generally I recommend there should be more education on the problems and solutions to noise pollution, the public needs to know this is something that affects them and the government needs to be educated on the cost of noise pollution. The education of the public and government alike will, hopefully, in the long run result in a change in legislation. As is the case for many other environmental stressors, without adequate legislation, private companies will continue to pollute at the expense of the public. So, influencing legislation should be the long-term aim of any campaign to mitigate noise pollution.

Noise pollution's grave threats to health and the environment demand immediate action. The Lund Trust can lead by fostering collaboration, amplifying impact, and championing awareness.

## Bibliography

- Alonso, G. et al. (2017) The efficiency of noise mitigation measures at European airports. *Transportation Research Procedia*. [Online] 25103–135.
- Änderung, L. (2022) Lärmsanierung des Bahngüterverkehrs: Die Alten Klötze Haben AUSGEBREMST, Bundesamt für Umwelt – Startseite. Available at: <https://www.bafu.admin.ch/bafu/de/home/themen/laerm/dossiers/laermsanierung-bahngueterverkehrs.html> (Accessed: 01 September 2023).
- Ashworth, J. (2022) Underwater noise pollution is risking the lives of whales and Dolphins, Natural History Museum. Available at: <https://www.nhm.ac.uk/discover/news/2022/july/underwater-noise-pollution-risking-lives-whales-dolphins.html> (Accessed: 31 August 2023).
- Basner, M. et al. (2014) Auditory and non-auditory effects of noise on health. *The Lancet (British edition)*. [Online] 383 (9925), 1325–1332.
- Bartsch, M. (2011) Protests at Germany’s largest airport: New runway noise enrages Frankfurt residents, DER SPIEGEL. Available at: <https://www.spiegel.de/international/germany/protests-at-germany-s-largest-airport-new-runway-noise-enrages-frankfurt-residents-a-806029.html> (Accessed: 01 September 2023).
- BBC (2017) Blue Planet 2: How plastic is slowly killing our sea creatures, fish and birds, BBC News. Available at: <https://www.bbc.co.uk/news/newsbeat-42030979> (Accessed: 31 August 2023).
- BBC (2010) Heathrow runway plans scrapped by New Government, BBC News. Available at: <http://news.bbc.co.uk/1/hi/england/london/8678282.stm> (Accessed: 29 August 2023).
- Benjamin, A. (2007) Campaign to stop Heathrow expansion takes to the roads, *The Guardian*. Available at: <https://www.theguardian.com/environment/2007/nov/08/travelandtransport.climatechange?gusrc=rss&feed=networkfront> (Accessed: 29 August 2023).

Brown, Jonathan (7 August 2007). "Joy for protesters as Heathrow is denied 'mother of all injunctions'". Available at: <https://web.archive.org/web/20080522155129/http://www.independent.co.uk/news/uk/crime/joy-for-protesters-as-heathrow-is-denied-mother-of-all-injunctions-460565.html> The Independent. London. 22 May 2008. Accessed 4 March 2008.

BTO (2023) The difference we make, BTO. Available at: <https://www.bto.org/difference-we-make> (Accessed: 29 August 2023).

CIEH (ed.) (2022) Noise survey, CIEH. Available at: <https://www.cieh.org/policy/campaigns/noise-survey/> (Accessed: 23 August 2023).

Coghlan, A. (2007) Dying for some quiet: The truth about noise pollution, New Scientist. Available at: <https://www.newscientist.com/article/mg19526186-500-dying-for-some-quiet-the-truth-about-noise-pollution/> (Accessed: 23 August 2023).

Crerar, P. (2012) Third runway noise will hit North London, Evening Standard. Available at: <http://www.standard.co.uk/news/third-runway-noise-will-hit-north-london-6619847.html> (Accessed: 29 August 2023).

Davis, N. (2019) Noise pollution rules should be tightened to protect wildlife, say scientists, The Guardian. Available at: <https://www.theguardian.com/environment/2019/nov/20/noise-pollution-wild-life-better-regulation> (Accessed: 23 August 2023).

Department for Environment Food and Rural Affairs DEFRA (2020) England-wide action for Nature: Nature recovery network launches, Defra in the media. Available at: <https://deframedia.blog.gov.uk/2020/11/05/england-wide-action-for-nature-nature-recovery-network-launches/> (Accessed: 31 August 2023).

Department for Environment Food and Rural Affairs DEFRA (2019a) Noise Action Plan Roads. UK Government. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploa>



ds/attachment\_data/file/813666/noise-action-plan-2019-roads.pdf#:~:text=This%20Action%20Plan%20applies%20to%20noise%20from%20road,of%20noise%20within%20agglomerations%20and%20from%20rail%20sources. (Accessed: 23 August 2023).

Department for Environment Food and Rural Affairs and DEFRA (2019b) Clean Air Strategy 2019. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/770715/clean-air-strategy-2019.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf) (Accessed: 2023).

Dreger, S. et al. (2019) 'Social Inequalities in Environmental Noise Exposure: A review of evidence in the WHO European Region', *International Journal of Environmental Research and Public Health*, 16(6), p. 1011. doi:10.3390/ijerph16061011.

Dunn, G. (2019) UK government review backs London Heathrow and London Stansted Airport Strategy, *Flight Global*. Available at: <https://www.flightglobal.com/uk-government-review-backs-london-heathrow-and-london-stansted-airport-strategy/71100.article> (Accessed: 29 August 2023).

EEA (2022) Noise low-emission zones in Monza, Italy, *European Environment Agency*. Available at: <https://www.eea.europa.eu/publications/outlook-to-2030/noise-low-emission-zones-in> (Accessed: 01 September 2023).

Eurostat (2021) Love thy neighbour – even if they are noisy, *Love thy neighbour – even if they are noisy – Products Eurostat News – Eurostat*. Available at: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20210101-1#:~:text=In%202019%2C%2017.3%25%20of%20the%20EU%20population%20reported,%2824.1%25%29%20than%20for%20those%20in%20rural%20areas%20%2810.4%25%29.> (Accessed: 31 August 2023).

Francis, C. D. et al. (2009) Noise Pollution Changes Avian Communities and Species Interactions. *Current biology*. [Online] 19 (16), 1415–1419.

Fraport (2023) *Noise abatement*, Fraport AG. Available at:

<https://www.fraport.com/en/environment/noise-abatement.html#:~:text=As%20the%20operator%20of%20Frankfurt%20Airport%2C%20we%20endeavor,use%20airplanes%20with%20low%20pollutant%20and%20noise%20output.> (Accessed: 01 September 2023).

Friends of the Earth (2023) *How we're run and Meet Our Team*, Friends of the Earth.

Available at: <https://friendsoftheearth.uk/how-were-run> (Accessed: 29 August 2023).

Godwin, R. (2018) *Sonic doom: How noise pollution kills thousands each year*, The Guardian. Available at:

<https://www.theguardian.com/lifeandstyle/2018/jul/03/sonic-doom-noise-pollution-kills-heart-disease-diabetes> (Accessed: 23 August 2023).

Government UK (2015) *Noise from roads, trains or planes*, GOV.UK. Available at:

<https://www.gov.uk/noise-pollution-road-train-plane/noise-from-roads> (Accessed: 23 August 2023).

Government UK (2022) *New trial to banish loud engines and exhausts on Britain's noisiest streets*, GOV.UK. Available at:

<https://www.gov.uk/government/news/new-trial-to-banish-loud-engines-and-exhausts-on-britains-noisiest-streets> (Accessed: 24 August 2023).

Greenpeace (2023) *Environmental issues, explained*, Greenpeace UK. Available at:

<https://www.greenpeace.org.uk/challenges/> (Accessed: 29 August 2023).

HACAN (2023) *A voice for those under Heathrow flightpaths* - HACAN, HACAN .

Available at: <https://hacan.org.uk/> (Accessed: 29 August 2023).

HACAN (2018) *Night flights briefing sheet* - [hacan.org.uk](http://hacan.org.uk), Heathrow Association for

the Control of Aircraft Noise. Available at: <http://hacan.org.uk/wp-content/uploads/2018/01/Night-Flights-Briefing-Sheet.pdf> (Accessed: 01 September 2023).

HACAN East (2023) *Hacan East*, HACAN East. Available at:

<https://www.hacaneast.org.uk/home> (Accessed: 29 August 2023).

- HACAN East (2023) City Airport: Key Statistics and a brief history, HACAN East. Available at: <http://www.hacaneast.org.uk/background/city-airport-history> (Accessed: 01 September 2023).
- Haines, M. M. et al. (2002) Multilevel modelling of aircraft noise on performance tests in schools around Heathrow Airport London. [Online]
- Halfwerk, W. et al. (2011) Negative impact of traffic noise on avian reproductive success. *The Journal of applied ecology*. [Online] 48 (1), 210–219.
- Homegate (2021) Night-time noise restrictions in Switzerland, Homegate.ch. Available at: <https://www.homegate.ch/c/en/advisor/renting/tenancy-law/night-time-noise-restrictions-in-switzerland-whats-allowed-and-whats-not#:~:text=The%20night%20hours%20of%20peace%2C%20along%20with%20the,7%20am%20Sundays%20and%20public%20holidays%3A%20all%20day> (Accessed: 31 August 2023).
- Hygge, S. et al. (2002) A Prospective Study of Some Effects of Aircraft Noise on Cognitive Performance in Schoolchildren. *Psychological science*. [Online] 13 (5), 469–474.
- International Noise Awareness Day (2023) International Noise Awareness Day, Noise Awareness Day. Available at: <https://noiseawareness.org/> (Accessed: 29 August 2023).
- Jasper, S. (2018) Sonic refugia: nature, noise abatement and landscape design in West Berlin. [Online]
- Khan, C. (2023) Shout it from the rooftops: The noise pollution in towns and cities is killing us, *The Guardian*. Available at: <https://www.theguardian.com/commentisfree/2023/apr/10/noise-pollution-britains-towns-cities-killing-us> (Accessed: 23 August 2023).
- Knipschild, P. V. Medical effects of aircraft noise: Community cardiovascular survey. *Int. Arch Occup Environ Health* 40, 185–190 (1977). <https://doi.org/10.1007/BF01842081>

- Kunc, H. P. & Schmidt, R. (2019) The effects of anthropogenic noise on animals: a meta-analysis. [Online]
- Lavia, L., Easteal, M., Close, D., Witchel, H.J., Axelsson, Ö., Ware, M., & Dixon, M. (2012). Sounding Brighton: practical approaches towards better soundscapes.
- Lewis, N. (2021) The fight to preserve the last quiet places on a Noisy Planet, CNN. Available at: <https://edition.cnn.com/travel/article/quiet-parks-quiet-places-noisy-planet-spc-intl/index.html> (Accessed: 29 August 2023).
- Li, M. et al. (2020) Sound absorption by tree bark. [Online]
- Maschke C, Hecht K, Wolf U. Nocturnal awakenings due to aircraft noise\*. Do wake-up reactions begin at sound level 60 dB(A)? . Noise Health 2004;6:21-33
- McMullan, T. (2019) Cities are louder than ever – and it's the poor who suffer most, The Guardian. Available at: <https://www.theguardian.com/cities/2019/apr/25/cities-are-louder-than-ever-and-its-the-poor-who-suffer-most> (Accessed: 23 August 2023).
- Morton, B. (2023) Councils failing to tackle anti-social behaviour, watchdog says, BBC News. Available at: <https://www.bbc.co.uk/news/uk-politics-66512729> (Accessed: 31 August 2023).
- Moshakis, A. (2022) Noises off: The battle to Save Our Quiet Places, The Guardian. Available at: <https://www.theguardian.com/environment/2022/jan/16/noises-off-the-battle-to-save-our-quiet-places> (Accessed: 29 August 2023).
- Natural England (2022) New 'super' national nature reserve created to protect Rare Wildlife, GOV.UK. Available at: <https://www.gov.uk/government/news/new-super-national-nature-reserve-created-to-protect-rare-wildlife> (Accessed: 31 August 2023).
- NEF (2023) Our missions, New Economics Foundation. Available at: <https://neweconomics.org/about/our-missions> (Accessed: 29 August 2023).

- Noise Abatement Society (2023) What is the Nas?, noise abatement society. Available at: <https://noiseabatementociety.org/> (Accessed: 29 August 2023).
- Nugent, C. (2016) Quiet areas in Europe The environment unaffected by noise pollution.
- Ow, L. F. and Ghosh, S (2017) Urban cities and road traffic noise: Reduction through vegetation. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0003682X17300270?via%3Dihub>
- Parker, L. (2023) Microplastics are in our bodies. how much do they harm us?, Environment. Available at: <https://www.nationalgeographic.com/environment/article/microplastics-are-in-our-bodies-how-much-do-they-harm-us#:~:text=The%20science%20is%20unsettled%2C%20but%20researchers%20say%20there,yet%20clear%20what%20that%20means%20for%20our%20health.> (Accessed: 31 August 2023).
- Peris (2020) Environmental noise in Europe – 2020. EEA.
- Perillo, A. et al. (2017) Anthropogenic noise reduces bird species richness and diversity in urban parks. [Online]
- OceanCare (2023) Urgent need to reduce underwater noise pollution, OceanCare. Available at: <https://www.oceancare.org/en/marine-conservation/underwater-noise-pollution/> (Accessed: 31 August 2023).
- O’Callaghan, J. (2020) Quiet and green: Why hydrogen planes could be the future of Aviation, Horizon Magazine. Available at: <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/quiet-and-green-why-hydrogen-planes-could-be-future-aviation> (Accessed: 29 August 2023).
- Quiet parks international (2023) Quiet parks international, Quiet Parks International. Available at: <https://www.quietparks.org/> (Accessed: 29 August 2023).

Ryan, M. (2006) UK | Village Faces being wiped off map, BBC News. Available at: <http://news.bbc.co.uk/1/hi/uk/4731948.stm> (Accessed: 29 August 2023).

RSPB (2023) RSPB mission statement: Our plans for nature, The RSPB. Available at: <https://www.rspb.org.uk/about-the-rspb/about-us/our-mission/> (Accessed: 29 August 2023).

Science and Technology Committee and House of Lords (2023) HOUSE OF LORDS Science and Technology Committee 2nd Report of Session 2022-23 The neglected pollutants: the effects of artificial light and noise on human health.

Slabbekoorn, H. (2019) Noise pollution. *Current biology*. [Online] 29 (19), R957–R960.

Sordello, R. et al. (2020) Evidence of the impact of noise pollution on biodiversity: a systematic map. *Environmental evidence*. [Online] 9 (1), 1–27.

Stanley, M. (2023) Noise pollution, National Geographic Education. Available at: <https://education.nationalgeographic.org/resource/noise-pollution/> (Accessed: 23 August 2023).

Stansfeld, S. & Clark, C. (2015) Health Effects of Noise Exposure in Children. *Current environmental health reports*. [Online] 2 (2), 171–178.

Stewart, J. et al. (2016) *Why noise matters: A worldwide perspective on the problems, policies and solutions*. London: Routledge.

Taylor, D. (2021) London councillor says HS2 building work is ‘a living hell’ for residents, *The Guardian*. Available at: <https://www.theguardian.com/uk-news/2021/jun/08/london-council-residents-hs2-construction-construction-high-speed-rail-project> (Accessed: 01 September 2023). TCV (2021) *The Conservation Volunteers Strategy 2021–25*, TCV. Available at: <https://www.tcv.org.uk/about/strategy/> (Accessed: 29 August 2023).

TfL (2023) ULEZ expansion 2023, Transport for London. Available at: <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/ulez-expansion-2023?gad=1> (Accessed: 01 September 2023).

The Equality Trust (2023) The Equality Trust, The Equality Trust | Working to improve the quality of life in the UK by reducing economic inequality. Available at: <https://equalitytrust.org.uk/> (Accessed: 29 August 2023).

The Wildlife Trust's (2023) About Us, The Wildlife Trusts. Available at: <https://www.wildlifetrusts.org/about-us> (Accessed: 29 August 2023).

The Woodland Trust (2023) UK's Largest Woodland Conservation Charity - Woodland Trust, The Woodland Trust. Available at: <https://www.woodlandtrust.org.uk/> (Accessed: 29 August 2023).

Tong, H. et al. (2021) Increases in noise complaints during the COVID-19 lockdown in Spring 2020: A case study in Greater London, UK. *The Science of the total environment*. [Online] 785147213–147213.

Trees for Cities (2023) Our work, Trees for Cities. Available at: <https://www.treesforcities.org/our-work> (Accessed: 29 August 2023).

Transport for London (2023) Ultra Low Emission Zone, Transport for London. Available at: <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone> (Accessed: 23 August 2023).

UK Noise Association (2023) UK noise association, UK Noise Association. Available at: <https://www.uknoiseassociation.com/> (Accessed: 29 August 2023).

UK Government (2015) Airports Commission: final report. UK Government.

UK Government (2023) Far-reaching ban on single-use plastics in England, GOV.UK. Available at: <https://www.gov.uk/government/news/far-reaching-ban-on-single-use-plastics-in-england> (Accessed: 29 August 2023).

Walawalker, A. (2019) Air Miles should be axed to deter frequent fliers, advises report, *The Guardian*. Available at: <https://www.theguardian.com/environment/2019/oct/14/air-miles-should-be-taxed-to-deter-frequent-fliers-advises-report> (Accessed: 31 August 2023).

Welsh Government (2023) Noise and Soundscape Plan for Wales 2023–2028 Our national strategy on soundscapes Consultation draft.

Whale & Dolphin Conservation UK (2023) Ocean pollution, Whale & Dolphin Conservation UK. Available at: <https://uk.whales.org/our-4-goals/create-healthy-seas/ocean-pollution/> (Accessed: 31 August 2023).

World Health Organisation (2018) Environmental noise guidelines for European Region.

Wisniewska, D. M. et al. (2018) High rates of vessel noise disrupt foraging in wild harbour porpoises (*Phocoena phocoena*). Proceedings of the Royal Society. B, Biological sciences. [Online] 285 (1872), 20172314–20172314.

Zulliger, J. (2021) What to do when neighbours are causing trouble, Homegate.ch. Available at: <https://www.homegate.ch/c/en/advisor/renting/tenancy-law/locking-horns-what-to-do-when-neighbours-are-causing-trouble> (Accessed: 31 August 2023).