

Nicola Pilkington ref 2002728 written comments2

ISH 15 relating to proposed desalination Plant- the Subject of Change of Request.

Session3 05<sup>th</sup> of October 2021

42.26 mins Noise and Vibration.

I ask EXA for clarification on whether advice from Behavioural Biologists had been sought to assess behavioural changes due to noise and vibration. I was pleased to hear that advice had come from Dr Jennifer Lynch on marine mammals. But I am greatly concerned That there had been no focus on alterations in avian acoustic behaviour due to noise and vibration or indeed to fish. Dr Peter Henderson would have been able to answer any questions on behavioural changes in fish. The RSPB expressed concern about noise impacting birds. It is a great pity that support on the issue has not come from someone with the expertise of Associate Professor Dr Hans Slabbekoorn (1) of the University of Leiden. He has been studying changes in Avian behaviour and sound as a result of human activity for many years. He has also been employed by Dutch Windfarms to assess changes in behaviour of fish (Cod) coming from noise and vibration.

1.30mins Air Pollution.

A point not clarified before Dr Lowe left is the important issue of workers safety and emissions coming from the generators and how close workers could safely be when the generators are operating. I refer to study by Emissions Analytics conducted over a 15month period based on London building sites. They say tests on an 8Kilowatt generator smaller than on many construction sites, emitted six times more Nitrogen Oxide than the average London Bus and 15 times more particulate matter per unit. (Reuters) (2)  
Would these levels of emissions be considered safe to work close to under new WHO Guidelines?

Note 2 attachments to come with this document



## Nicola Pilkington ref2002728- Written Comments

ISH15 Relating to proposed Desalination Plant – The Subject of Change of Request.

Session2 October 05 2021

25.3mins Noise

I grew up in a house with no mains electricity so we relied on a diesel generator for electricity. I know from experience that they can make a lot of noise at night and I am concerned about something Mr Philpott said about the proposed generators not being heard above the background noise coming from the construction site. This would indicate to me that the combined noise would be very noisy and so I think it would be useful to hear a recording of the noise coming from the proposed generators.

Session3 October 5<sup>th</sup> 2021

1.09mins Pollution.

EDF Pre-Consultation Environment Impact Assessment in 2012 mentions monitoring of Nitrogen Oxide since 2009-10 but no mention of particulate matter across the proposed construction site and surrounding area. I would like to know why these never took place?

I support TASC'S concerns about particulate matter.

What I am concerned about is that over the last 12 years the evidence has changed on the health impacts of particulate matter yet EDF have done nothing to supply baseline evidence across the construction site and beyond.

I shall be supplying written evidence to support TASC'S statement going back to 2007 with WWF'S Report on the dangers of desalination plants and then subsequent reports on the dangers of diesel generators and up to date research on PM2.5's. I would like a reply from Mr Philpott as to why Baseline monitoring was never undertaken for PM 2.5's?

References.

[https://wwf\\_news/?107520/WWF-Report-Desalination-option-or-distraction-for-a-thirsty-world](https://wwf_news/?107520/WWF-Report-Desalination-option-or-distraction-for-a-thirsty-world)

<https://www.who.int/news-room/q-a-detail/who-global-air-quality-guidelines>

[Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution phase1](#)

# WWF Report: Desalination – option or distraction for a thirsty world?

*Posted on 25 June 2007*

Making drinking water out of sea water is a growing trend but it also poses a potential threat to the environment that could exacerbate climate change, says WWF in a global review of desalination plants worldwide.

Making drinking water out of sea water is a growing trend but it also poses potential threat to the environment that could exacerbate climate change, says WWF in a global review of desalination plants worldwide.

The WWF review, Making water: Desalination – option or distraction for a thirsty world?, shows that some of the driest and thirstiest places are turning to desalination. These include regions where water problems affect large, populous areas — Australia, the Middle East, Spain, the UK and US, with India and China following suit.



Making drinking water out of sea water is a growing trend but a potential threat to the environment.

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## Quick guide Noise pollution

Hans Slabbekoorn

**What is noise pollution?** Noise pollution refers to the elevation of natural ambient noise levels due to sound-generating human activities, which may have detrimental consequences for humans and animals alike (Figure 1). Sounds of this kind are often referred to as anthropogenic noise. Some of these sounds are deliberate and wanted, such as music, sirens, seismic survey sounds or military sonar. Most anthropogenic noise, however, is an unwanted by-product, such as traffic or generator noise, and impulsive sounds from pile driving and explosives.

**Is the natural world quiet?** No, the natural world has always been filled with sound of abiotic origin, like wind, rain, thunder, waves, cracking ice, and rustling leaves. Also sound of biotic origin has been around for evolutionary time periods. Well known biotic sound examples include: singing and calling from birds, mammals, frogs and insects, but also echo-locating or splashing whales, food scraping reef fishes or sea urchins, and snapping shrimps.

**Do natural sounds matter to animals?** Depending on the animal species, natural sounds may be biologically relevant acoustic signals and cues or irrelevant but potentially problematic background noise. Sounds can be particularly important to animals when visibility is low, as in dense forest, underwater or in nocturnal conditions. Animals may communicate with vocalizations to find group members and potential mates, or to find prey by passive acoustics or active echolocation. They may also use sound to detect and escape predators or to find their way to any resource or hiding place through so-called soundscape orientation.

**What are the main sources of noise pollution?** The most prominent and

widespread (spatially and temporally) sources of anthropogenic noise are traffic of all sorts: cars, trucks, planes and vessels. Examples of locally intense and more short-term or repetitive sound sources are explosions, pile driving, seismic surveys, and military sonar. Examples of more moderate but also more long-term and lasting sound sources are highway traffic, ferry lines, shipping lanes, industrial generators, busy airports, construction sites, motorized recreation, air conditioners, cleaning machines, dredging, and pumping systems.

**When did the Anthropocene start acoustically?** The impact of people on natural soundscapes must have grown gradually with the human population growth on earth and the use of stones and metal for construction and tool making in the Stone, Bronze and Iron Ages. High-intensity anthropogenic sound events may have emerged with the invention of gunpowder in China, in the 9<sup>th</sup> century, used for mining, warfare and demolition. However, the invention of the steam engine, and the industrial revolution in general, by the end of the 18<sup>th</sup> century, can be regarded as the real start of steady growth of industrial and traffic noise in the western world. The automotive industry rose in the USA by the end

of the 19<sup>th</sup> century and a considerable acceleration in car production happened soon after World War II, in which period commercial aviation also started to grow rapidly. Growth in noise pollution levels in the oceans roughly coincided with that in air, and was primarily related to the cold war increase of sonar use and the steady incline in global shipping activity associated with international trade. Seismic exploration for geophysical surveys started about 90 years ago, while pile driving for wind turbines at sea in coastal areas is a recent growth sector of the last decade.

**How are people affected?** Humans may get direct or delayed hearing damage from acoustic overexposure and direct damage may be temporary or permanent, making someone more or less deaf for a while or forever. More moderate levels of anthropogenic noise may cause annoyance, chronic stress, sleep disturbance, decreased speech intelligibility, slow-down of cognitive development, performance decline in precision work, delayed wound healing, and even increased probability of heart failure (Figure 2).

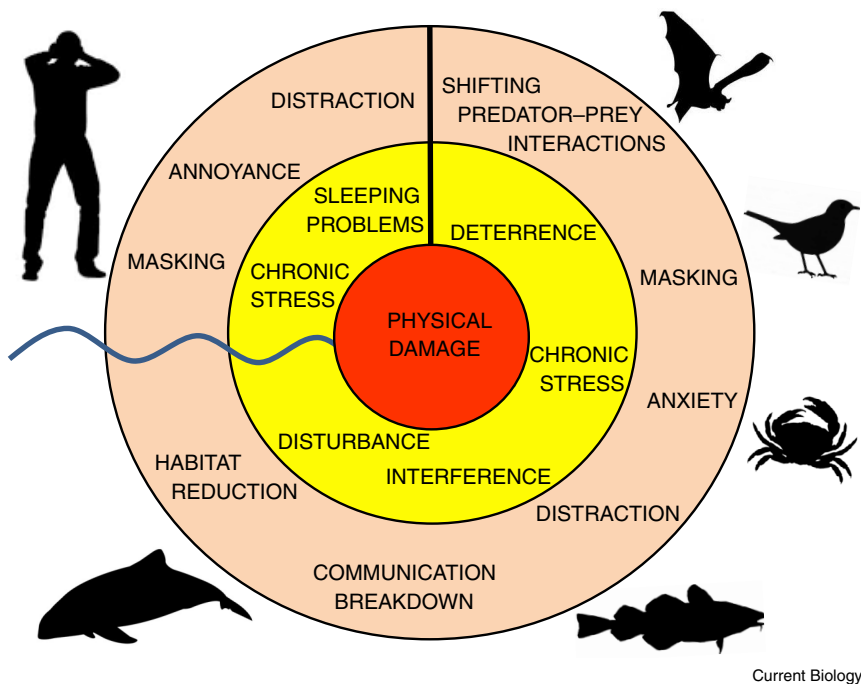
**How are animals affected?** Animals may also get hearing damage by acoustic overexposure, with temporary or permanent auditory



**Figure 1. Anthropogenic noise affects birds and fishes.**

Birds in cities, along highways and around airports are exposed to a variable degree of more or less fluctuating sound levels. They are reported to sing at higher amplitude and higher frequency than rural congeners by which they alleviate masking problems at noisy times and places. Still, avian diversity and density are detrimentally affected by noise pollution and there seems to be more impact on low- than on high-frequency singers. Shipping lanes and motorized recreation also make the underwater world noisy. Boat sounds from the engine and propeller-generated cavitation can disturb spawning fishes, cause physiological stress, deter schools to deeper water, or delay migratory journeys. Great tit by Herman Berkhoudt and London background by Philip Greenspun, used with permission.





**Figure 2. Diverse effects of noise pollution.**

Potential effects of noise pollution on humans and animals in air and in water vary with sound level, duration, spectrum, temporal pattern, and distance from the source. Exposure to the most intense sound close to the source (in red) can cause physical damage to the auditory system and rupture organs or blood vessels. The behavioural or physiological consequences for individual animals to more moderate sounds at larger distances (in yellow and orange) may seem less dramatic, but they are more widespread and affect many more species and individual animals. Apparently subtle changes in the acoustic climate may, therefore, have the potential to accumulate to population-level problems or ecosystem shifts.

threshold shifts. At close range, extreme sound sources may cause physical damage such as organ ruptures and internal bleeding, as reported for aquatic animals. Behavioural responses can also be fatal in the case of strandings of marine mammals. Other behavioural effects of anthropogenic noise include disturbance and deterrence, but also masking and distraction, which may have relatively subtle consequences for individuals, but potentially concerns large numbers of animals and species (Figure 2).

#### **Does impact depend on sound features?**

Anthropogenic sounds as well as natural ambient conditions vary in level, spectrum and temporal patterns. As mentioned above, super intense sounds are most likely to cause physical damage, even after brief overexposure, although the duration of exposure will add to the probability of impact. Sudden and irregularly repeated sounds,

or sounds particularly contrasting with the acoustic background and locally unfamiliar, have especially high potential to deter, disturb, and distract. These kinds of problems will be less when natural ambient conditions are already noisy, such as in turbulent weather or during periods of chorusing by large numbers of animals. For the same reason, more continuous anthropogenic sounds, overlapping in spectrum and in time with acoustic signals and cues, have the most potential to mask natural sounds, for example interfering with animal communication.

#### **Do all animal species hear the same?**

No, animals do not necessarily hear what humans do and there is much taxonomic variation in what frequencies different species are able to hear. Humans hear sounds of between 20 Hz and 20 kHz, with highest sensitivity between 1 and 6 kHz. Most birds have a similar frequency range as humans, except

for often lower sensitivity in the upper half of the range. Carnivores, like dogs and cats, have high sensitivity up to 30 or 40 kHz, while there are bat species with good sensitivity up to 100 kHz. Rodents, like mice and rats, also hear well in high frequencies like carnivores, but hear less well below 20 kHz, and hear even badly below 2 kHz. Most invertebrates and fishes are only sensitive to low frequencies, some starting around 10 Hz, up to 1 kHz, or exceptionally up to 4 kHz or higher. Marine mammals vary extensively, with large baleen whales being sensitive to very low frequencies (10 Hz to 10 kHz) and smaller dolphins being sensitive to very high frequencies (3 kHz to 160 kHz).

#### **Do hearing ranges matter for noise impact?**

Yes, it does matter what animals hear, as sounds that remain undetected will not deter, disturb, or distract and detrimental signal-to-noise ratios cannot lead to masking if signals would not have been heard anyway. As most anthropogenic noise is biased to low frequencies (below 2 kHz), it is expected to have an impact on humans and birds, and especially on invertebrates, fishes and baleen whales. Rodents and bats in air and dolphins in water will be less likely to have problems with most sources of noise pollution. However, even when anthropogenic noise is just audible, there may still be a behavioural effect. Furthermore, we sometimes also generate exceptionally high-frequency sounds, such as with some types of light sources, monitors, or military sonar. These sounds can bother mice or dolphins, while inaudible to us.

#### **Can animals get used to noise pollution?**

Sound-induced deterrence, disturbance and distraction may fade due to habituation to continuous or repeated exposure. Animals may exhibit fading responsiveness to the same sound of the same intensity in case such sounds are not associated with some direct negative consequences. Animals may even also learn to associate initially frightening sounds with positive experiences and may become acoustically attracted.

Dolphins may, for example, approach so-called pingers at fishing nets, which are designed to deter, but having potential to become a dinner bell. Animals can also become skilled in extracting biologically relevant sounds from a familiar background of irrelevant sounds. They may perceptually tune into frequencies that are best audible. However, masking problems rendering relevant sounds undetectable do not fade over time.

**Can animals adjust to noisy conditions?** Yes, there are many examples in which acoustically communicating animals adjust their vocal signals under noisy conditions, which often makes them better audible. Primates, bats, birds, frogs and fishes have all been reported to sing or call louder under more noisy conditions, as we do when raising our voice when a party becomes noisy. Many animal species (and humans) are also reported to respond to noise by raising the frequency of the sounds they make, as in the case of urban birds which famously sing higher at times or in neighbourhoods with elevated levels of low-frequency traffic noise. Finally, animals may also repeat more often or adjust timing of their vocal activity such that its overlap with masking noise is reduced. In contrast to signals that serve senders and receivers in communication, biologically relevant cues from prey or other resources are obviously not adjusted to the fluctuating noise levels to accommodate receivers.

**What are the consequences for biodiversity?** Birds and frogs in particular have been found to be negatively affected in their distribution patterns by noise pollution. Lower diversity and density near noisy highways, airports, or generators at gas extraction stations clearly indicate noise-determined habitat reduction. Sound contributes to the detrimental effects of roads and cities on wildlife, next to and often beyond the range of other factors such as chemical pollution, altered vegetation, artificial lightning, collision and disturbance by human presence. Animals may avoid noisy areas, but for various

bird species there is also evidence for noise-dependent reduction in breeding success. Terrestrial mammal species are also reported to avoid noisy areas and often become more nocturnal. There are also species that remain unaffected and persist in noisy areas or even benefit from the noise-dependent disappearance of competitors or predators. Intriguingly, not only can predator–prey interactions shift due to noise pollution, but effects on seed dispersers and seed predators can even cause noise-dependent patterns in vegetation.

**Are effects of noise pollution also apparent underwater?** Long-term, noise-dependent distribution patterns are more difficult to assess in marine systems. Short-term deterrence of fishes and marine mammals have been reported from areas exposed to seismic survey sounds, pile driving activities, and explosions. The same species can be seen back hours, days, or weeks after the impact. It is typically unclear, however, whether these are the same or other individuals and whether there are any detrimental consequences from missed foraging or spawning opportunities, or increased risk of predation or larger energy expenditure. Also invertebrates, such as octopuses, crabs, lobsters, barnacles, molluscs and jellyfish are known to respond with behavioural and physiological changes to experimental sound exposure, while pelagic larvae across taxa are guided by acoustic cues for settlement in appropriate habitat. Consequently, the widespread nature of noise pollution may cause shifts at the bottom of the food chain, with potential for trophic cascades.

**Are marine mammal populations threatened by noise pollution?** Marine mammals seem especially vulnerable to acoustic disturbance in case of mother–calf pairs, for which splitting up may be fatal. Other threats may come from delays or deviations in long-range foraging trips or optimal migratory pathways. For some species, such as elephant seals (*Mirounga leonina*), rare empirical data are used to show population

level effects through so-called Population Consequences of Acoustic Disturbance (PCAD) models. These PCAD models translate behavioural and physiological disturbance into individual vital rates of growth, maturation, survival and reproduction, which accumulate to predictions about effects for the population. The results indicate that persistent disturbance by noise can have long-term effects contributing to population decline.

**What are the gaps in our current understanding?** It is clear for many species that noise pollution can cause changes in behaviour or induce physiological stress. For some such changes it is obvious that they will be detrimental for individual health and welfare. This could translate into consequences for survival and reproduction, but has been explored for only very few species. Furthermore, lowered fitness for individuals has the potential to yield population consequences, but this is even less explored, often lacking sufficient empirical data. If these translation steps from behaviour and physiology to vital rates to population consequences were to be completed for a particular species, dynamic processes at the ecosystem level remain to be investigated. Effects of noise pollution go beyond single species, may affect predator–prey interactions, and may work their way up the trophic levels of ecological food webs. However, only few studies have been done and only recently has our awareness been raised about the potential for this ecosystem impact.

**Should we speak about “acoustic climate change”?** Due to the global nature of spread and taxonomically wide impact of noise pollution, it seems indeed reasonable to speak about acoustic climate change. Sound impact has typically been studied for a single source type and a single species. However, animals are often exposed to multiple noisy activities at the same time or in sequence, potentially in parallel with other disturbing factors such as changes in temperature regimes, drought, salinity, or invasive species. Investigating cumulative effects of



different stressors will therefore be critical for our understanding of the ecological consequences of noise pollution and to come up with efficient measures for potential mitigation. We better treat noise pollution, like global warming, as an integral part of the global threat of human-induced climate change.

### Where can I find out more?

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## Essay

# Multiple threats imperil freshwater biodiversity in the Anthropocene

David Dudgeon

Appropriation of fresh water to meet human needs is growing, and competition among users will intensify in a warmer and more crowded world. This essay explains why freshwater ecosystems are global hotspots of biological richness, despite a panoply of interacting threats that jeopardize biodiversity. The combined effects of these threats will soon become detrimental to humans since provision of ecosystem services, such as protein from capture fisheries, can only be sustained if waters remain healthy. Climate change poses an insidious existential threat to freshwater biodiversity in the Anthropocene, but immediate risks from dams, habitat degradation and pollution could well be far greater.

In a warmer and increasingly human-dominated planet, many Earth-system processes are dominated by human activities [1,2], and a pandemic array of physical and biological alterations to freshwater ecosystems are associated with rapid shifts in water use [3,4]. Water is an irreplaceable resource for people and biodiversity, and consumption or contamination of water by one group of human users makes it unavailable or unfit for others. For instance, abstraction of river water for irrigation reduces the downstream supply to the detriment of those who make a living from fishing. If it remained in the river channel, the same water might generate hydropower, flush wastes downstream, permit navigation, or sustain biodiversity. Because uses by humans and non-humans often conflict, and interests among human stakeholders differ also, fresh water is the common resource *par excellence*.

In this essay, I describe the principal threats to fresh waters, and outline how these might intensify during the Anthropocene. I also explain why fresh waters are hotspots of global species richness, and the features that enhance the susceptibility of that biodiversity to burgeoning anthropogenic threat. Together, these features have driven recent declines in species and populations that need to be halted or reversed. Conservation action is most likely to be effective where it can be demonstrated that freshwater biodiversity enhances provision of ecosystem services for humans. Irrespective of this, I argue that immediate steps to constrain dam building and control pollution will

enhance the resilience of freshwater ecosystems, and need to take place in conjunction with attempts to reduce the medium-term impacts of climate change.

### Principal threats to the freshwater commons

Fresh waters are especially susceptible to changes arising from 'the tragedy of the commons'. Scant consideration is given to the need to conserve aquatic biodiversity or preserve ecosystems when conflicting human interests are at stake. In most cases, only the fresh water that remains after human needs have been satisfied is available to sustain ecosystems. Nature often receives an inadequate share, such that flows of some major rivers (the Colorado, Indus, Ganges and Yellow Rivers) cease before reaching the coast. The over-abstracted Syr and Amu Darya no longer flow to their destination, resulting in the calamitous drying of the Aral Sea — perhaps the world's worst environmental disaster. On a larger scale, climate change is an example of human misuse of the global atmospheric commons, reflecting the unwillingness of individual states (and particular stakeholders) to limit carbon emissions.

Globally, the treatment of fresh waters as a commons has resulted in reduced human water security and widespread threats to biodiversity (e.g. [4]). The nature and intensity of factors degrading particular waters vary substantially. For instance, in countries where urbanization is proceeding rapidly (such as India and China), much riverine habitat is





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> [Res Rep Health Eff Inst.](#) 2019 Nov;(200):1-51.

# Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution: Phase 1

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Affiliations  
PMID: 31909579

## Abstract

**Introduction:** This report provides a summary of major findings and key conclusions supported by a Health Effects Institute grant aimed at "Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Pollution." Our study was designed to advance four critical areas of inquiry and methods development.

**Methods:** First, our work focused on predicting short- and long-term exposures to ambient PM<sub>2.5</sub> mass (particulate matter ≤ 2.5µm in aerodynamic diameter) and ozone (O<sub>3</sub>) at high spatial resolution (1 km × 1 km) for the continental United States during the period 2000-2012 and linking these predictions to health data. Second, we developed new causal inference methods for exposure-response (ER) that account for exposure error and adjust for measured confounders. We applied these methods to data from the New England region. Third, we applied standard regression methods using Medicare claims data to estimate health effects that are associated with short- and long-term exposure to low levels of ambient air pollution. We conducted sensitivity analyses to assess potential confounding bias due to lack of extensive information on behavioral risk factors in the Medicare population using the Medicare Current Beneficiary Survey (MCBS) (nationally representative sample of approximately 15,000 Medicare enrollees per year), which includes abundant data on individual-level risk factors including smoking. Finally, we have begun developing tools for reproducible research - including approaches for data sharing, record linkage, and statistical software.

**Results:** Our HEI-funded work has supported an extensive portfolio of analysis and the development of statistical methods that can be used to robustly understand the health effects of long- and short-term exposure to low levels of ambient air pollution. This report provides a high-level overview of statistical methods, data analysis, and key findings, as grouped into the following

four areas: (1) Exposure assessment and data access; (2) Epidemiological studies of ambient exposures to air pollution at low levels; (3) Methodological contributions in causal inference; and (4) Open science research data platform.

**Conclusion:** Our body of work, advanced by HEI, lends extensive evidence that short- and long-term exposure to PM<sub>2.5</sub> and O<sub>3</sub> is harmful to human health, increasing the risks of hospitalization and death, even at levels that are well below the National Ambient Air Quality Standards (NAAQS).

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