



Science and Technology Committee

Corrected oral evidence: The effects of artificial light and noise on human health

Tuesday 25 April 2023

11.15 am

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Members present: Baroness Brown of Cambridge (The Chair); Lord Borwick; Viscount Hanworth; Lord Holmes of Richmond; Lord Krebs; Baroness Neuberger; Baroness Neville-Jones; Baroness Northover; Lord Rees of Ludlow; Lord Sharkey; Baroness Warwick of Undercliffe; Lord Wei; Lord Winston.

Evidence Session No. 10

Heard in Public

Questions 106 - 114

Witnesses

John Stewart, Chair, UK Noise Association; Lisa Lavia, Managing Director, Noise Abatement Society.

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

John Stewart and Lisa Lavia.

Q106 **The Chair:** I welcome our witnesses to the committee's 10th evidence session for our inquiry into the effects of artificial light and noise on human health. In this session, we will focus on noise.

We are pleased to welcome John Stewart, chair of the UK Noise Association, and Lisa Lavia, managing director at the Noise Abatement Society. The session is being broadcast on parliamentlive.tv, and a transcript will be made available to witnesses shortly after the session to make any minor corrections. If you think of anything that you wish you had said or any further evidence that would be useful to us, we would be delighted to receive it as written evidence after this session.

I will ask the first question. Could you both briefly outline your work to date on noise pollution and why it is a concern, particularly in the context of human health?

Lisa Lavia: Thank you for the opportunity to provide oral evidence to the committee. I work for the Noise Abatement Society, a charity that was founded in 1959—I believe my colleague from Quiet Mark told the committee this a couple of days ago—by John Connell, who lobbied the Noise Abatement Act through Parliament in 1960, making it the UK's first statutory noise regulation. Since then, there have been other iterations of noise law, but the Noise Abatement Act 1960 was one of the founding pieces of legislation. The CEO of the society, Gloria Elliott, is John Connell's daughter, and I joined it in 2009.

The society's work has always been very pragmatic. Rather than campaigning against things per se, its viewpoint has always been, "How can the society work with a wide group of stakeholders, including communities, to effect pragmatic solutions to noise pollution?"—the premise being that noise is created by humans, so we can find human solutions. It might not be easy, but it is possible. The society does its work, and its charitable remit is, to find solutions to noise pollution problems for the public benefit. The NAS is the only registered charity solely focused on noise pollution in the UK. We are a small charity, and we tend to focus our work, in a targeted way, on campaigns, research and activity with policy-makers and stakeholders to effect pragmatic solutions to critical problems that are perhaps not easily solved elsewhere and on which extensive work is not already taking place.

That leads me on to one of the main things I will discuss here: our work on soundscape, which I believe there might be a question on. The society started working on soundscape management, as a solution to noise pollution problems in the UK, in 2009. Since then, I have been a member of the ISO working group developing standards on soundscape, and a member of the equivalent British Standards Institute—BSI—committees. I am also a member of the Institute of Acoustics. I have an MBA; my background is in communications and stakeholder engagement for

commercial business-to-business companies. I have been working in the charitable sector since 2009, as I said, and I am currently conducting PhD research on soundscape, engagement and planning.

The Chair: Can you comment particularly on noise pollution in the context of human health? That is what our inquiry is about.

Lisa Lavia: Most certainly. It is impossible to solve noise pollution based on just the conventional ways that noise is currently dealt with. Therefore, there is a need for alternative ways to understand the human perceptual response to sound, the non-acoustic and other factors, which the committee has heard about. That is where soundscape comes in, because people respond to sound based on their perceptual reaction in context, which can create annoyance if they hear something that they do not like or do not want to hear. That is the indirect health pathway that triggers the sympathetic nervous system and creates stress responses. If that is prolonged, it can lead to other extreme health conditions and mental health conditions including those related to trauma and PTSD, in some cases, in relation to noise.

We see this played out extensively, and I am sure John will also speak about this. One example is in aviation. Although equipment and planes might be getting objectively quieter, human annoyance with aviation is going up. So there tends to be an inverse relationship between people's perception of sound—if they do not like it, it is noise—and what we might be able to objectively measure, even when things are quieter. So there is a direct link to having more positive holistic solutions to solve noise problems, and that has a direct impact on individual and, ultimately, population-level health.

John Stewart: Good morning to you all. At the UK Noise Association, we cover all aspects of noise, but I suppose the main concerns are neighbour noise, neighbourhood noise, traffic noise and aircraft noise. The various studies show that that is what most people get annoyed about.

The question of health is interesting. The association has been around for just over 20 years, and noise and health has come up the agenda, and rightly so. We may talk about this later, but the World Health Organization has played a large role in this. Its latest guidelines, in 2018, showed that people get annoyed by noise—and therefore their health could be impacted—at much lower levels than was recognised even 10 years ago. This is almost the critical thing: that, for a long time, noise was seen as a quirky issue or, if it is very loud, as something that could affect your health. The World Health Organization and other bodies are now saying that, even at relatively low levels of noise, there can be health implications. That, I think, is the big change over the last decade.

The Chair: One of the things that we are struggling with, on both noise and light, is the very clear scientific evidence that links to the impacts on human health.

John Stewart: There is some evidence, particularly from the northern European countries and in the Netherlands and Germany. The World Health Organization's 2018 guidelines linked it by saying that, at a

certain point, a person will get annoyed, and when someone is annoyed that can affect their health. It does not quite say, although it came close to saying, that if you are not annoyed it cannot affect your health. That is not quite right, and there are studies that show that not to be the case.

The key determinant of whether noise can affect your health, as far as the World Health Organization was concerned, was annoyance. As hinted at just now, it found that people are getting annoyed by noise at lower levels than previously accepted and recognised. Therefore, the health implications could be greater than previously recognised. But further work is needed to develop the thoughts of the World Health Organization.

Q107 Lord Sharkey: How well is the UK's policy response currently tackling the problem of noise pollution? Perhaps we can use a scale of one to 10. Is it being given appropriate priority by the decision-makers?

Lisa Lavia: As the committee may have heard from other witnesses, we give it five out of 10. On the positive side, at a civil servant level, we have very good engagement and there is a definite understanding of the range of issues related to noise and health, especially in the case that I am emphasising, the perceptual response, which is an indirect health trigger. We have more limited evidence on this, but nonetheless it is extremely important, and that evidence base is growing.

On the negative side, I give it only a five because, in the ministerial and whole-of-government approach, we have seen almost a de-emphasis on noise. Institute of Acoustics colleagues noted the *Noise Policy Statement for England*. We welcomed it, but we felt that it certainly could have gone further in its prescription of what it expected government departments to do. But even that seems de-emphasised, with the notation on the policy webpage now saying that it was brought in under a different Government. That sends a very mixed message. Again, as you have just heard on light, the 25-year Environment Plan made no mention of noise, which is very confusing. What emphasis do the Government place on noise? More importantly, the problem is that this sets a tone whereby it appears that government is not keeping pace with the change in evidence and innovation in how we measure and assess noise impacts.

On John's point, the World Health Organization pointed out, and this is well acknowledged by noise researchers, that only about a third of the human response to noise is related to objective levels, yet most noise in the built environment is dealt with based on objective levels. Therefore, the industry is operating with an acknowledged 70% error rate, which is made up of about a third of so-called non-acoustic factors, many of which have been identified—as personal, social and tangible factors—and about a third of others that the World Health Organization euphemistically refers to as “other factors”, whatever they might be.

We might say that these are all non-acoustic factors to some extent, but the point is that it is necessary to research all those factors together to come up with better evidence and more holistic solutions. To the Chair's point—this is one reason why we have very limited evidence at this stage—developing that evidence requires a transdisciplinary research

programme. By that I mean that the engineering sciences, which currently do a lot on noise, and some of the health sciences, which also do that, and the humanities and social science protocols, need to be mixed together to come up with new protocols and new ways of assessing indicators and contextually salient non-acoustic factors to provide the evidence required for a committee like this.

We are at the very beginning stages of even an acknowledgement of that. Professor Clark pointed out that this starts with things like aural diversity and soundscape. These are in their early stages. None the less, they are critical and necessary, and they are beginning to happen. With a lack of strategic emphasis on this at a government level, where is the incentive for businesses, researchers and industry to begin to participate in this?

John Stewart: I will go a little lower than Lisa and say maybe three out of 10. I agree with an awful lot of what Lisa said. There are two main reasons, as far as I can see, why noise has been de-emphasised—I liked that word. One is that other pollutants have been seen as more important. Particularly over the last five or 10 years, climate change has gone up the agenda. Clearly, it is an issue, but government and perhaps the wider environmental movement have emphasised climate change virtually to the exclusion of everything else. That needs to be addressed, because there can be noise consequences, as we may find out later when we talk about energy, from some of the solutions to climate change. Air pollution has also gone up the agenda, and rightly so, and as both of those have gone up the agenda, noise pollution has gone down.

Secondly, government is less inclined to prioritise noise because it is seen as an individual and often as a local problem. If people are concerned about climate change, as we saw last weekend, you can get hundreds of thousands of them on the streets, concerned about a collective problem. You rarely get that with noise. You do in particular circumstances, if certain areas are or will be affected by noise; the third runway at Heathrow is probably a good example. But noise is largely an individual problem, so it is much easier for Governments, and to some extent local authorities, to marginalise and de-emphasise it, because they do not have the same collective pressure on them as they do with some of the other pollutants.

It is not only an individual problem. Noise affects—not exclusively but often and predominantly—lower income households. The stats are quite clear, particular for neighbour noise. Those are the people who are less likely to make their voices heard within the system. So it is de-emphasised, and other pollutants are emphasised more, but there are reasons for that and I am trying to outline some of them.

Lord Sharkey: Is the noise policy statement useful? Does it need changing or updating?

Lisa Lavia: When it was being drafted, NAS was consulted informally, and we fed into the draft that we felt that it needed to include more future-looking elements, including soundscape, because the work on the ISO soundscape standards was just beginning. There was already a

reasonable evidence base about the importance of soundscape and the more holistic ways of measuring noise to take non-acoustic factors into account. So we said, “Why not put something more explicit in the NPSE?” We did not win that debate, but we support that the NPSE links with the UN’s Sustainable Development Goals. So we are glad that it is there, but we would certainly like to see it modernised and updated.

I declare an interest: we have consulted for the Welsh Government on the recent update to their Technical Advice Note 11 on noise which moved from focusing just on noise to focusing on noise, air quality and soundscape, harmonising those pieces of legislation. We consider that technical advice note—and Supporting Document 1 on soundscape which we participated in the drafting of—an exemplar. I would say that, wouldn’t I? It is not based just on our recommendations; the Welsh Government decided that it was important to link a more holistic approach to noise.

From a positive perspective, we would say that it is great that that example exists, and it has been widely consulted on so it is not just our opinion, but we feel that it is time that the *Noise Policy Statement for England* takes a similarly wider and holistic outcomes-based approach that takes into account these areas of non-acoustic factors and soundscape, so that it sets an expectation for industry and researchers to begin to pull together a more transdisciplinary evidence base to support development.

John Stewart: It was good and ground-breaking at the time. The civil servants in Defra did a tremendous job on it and on trying to make it relevant to other government departments and for them to take it on board when formulating their policies. But it is very brief, very short and very general. As Lisa said, it needs to be more holistic and to have more detail. I am not looking for a detailed 24-page document, but it needs a little more than the few sentences that we have now.

Q108 **Lord Sharkey:** You both said that we need more research, or that the research base is currently insufficient. What more do we need? In what specific areas would more research be most useful?

Lisa Lavia: It might be a long list, but if I called for one specific item it would be an overt focus on transdisciplinary noise research. At the moment, most noise research is led by engineering and/or health colleagues. Extremely important as they are, what is lacking is transdisciplinarity across the health and engineering disciplines that then includes social science and humanities disciplines. The nexus of those disciplines coming together is required to get the type of evidence that can help us to illuminate and elucidate the indicators that are salient in certain types of contexts. This can help to address these non-acoustic factors and the perceptual aspects of people’s response to sound, and to triangulate this with the objective evidence, of which there is a large base, in the engineering and the health communities.

John Stewart: That is probably right. I would add three things. First, there is a lot of research on noise already. We may come on to this, but

Governments can say, "Let's have more research", as an excuse for not doing very much. There is a lot of research there, and part of me says, "Just get on with implementing policies to reduce noise".

In addition to what Lisa said, there are two areas where we probably need more research: the new upcoming areas of new energy, and drones and light aircraft. We have called for a noise audit of all new energy sources—wind, nuclear, heat pumps and solar. They are new, and we do not think they have been researched properly for noise. There is also a danger that drones and light aircraft will come in before the research has been done and the regulations are in place.

Q109 Lord Krebs: My question follows neatly on from John's last comment that, although there are areas where we need more research, we have enough evidence to get on with practical action. What are your priorities for practical action to reduce noise pollution? Are there significant easy wins, where noise pollution could be curtailed if it were given sufficient priority?

John Stewart: Yes, I think there are. As I said at the beginning, the two areas that most affect people are traffic noise and neighbour and neighbourhood noise. I will deal with them, because there are possible solutions. A study done in the Netherlands some years ago said that traffic noise could be reduced by about 70% without dealing with the volume of traffic. Clearly, if you can reduce the volume of traffic, you can reduce noise, but other things can be done quite quickly.

The main thing for noise is lower speed limits, or enforcement of current ones. There is a clear correlation between noise and speed. It may be politically difficult at times, but in technical terms it is not difficult at all. It could be a quick win.

The second relatively quick win is introducing what is called porous asphalt—low-noise surfaces—on roads. We would like the Government—any Government—to have a rolling programme, starting where the roads are noisiest or where they have the most impact on people, and slowly introducing quiet road surfaces as repairs take place. That could considerably reduce the noise impact.

The other thing that is coming in is electric cars, which will be quiet up to a certain level. They will reduce noise a lot, until cars get to about 35 miles per hour. After that, tire noise takes over and they will not be so effective. This is coming in.

Those are my three things: lower speed limits, quieter road surfaces, and electric cars. You would not eliminate noise, but you would significantly reduce it in areas where people live.

On neighbour noise, it is a question of enforcement. The laws tend to be there—they have been introduced over the last 20 to 30 years—but they are not being enforced properly, partly because of a lack of resources among local authorities. However, if truth be known, some local authorities were never very keen on enforcing them, even when they had

the resources. It was a bit of a postcode lottery. But enforcement of neighbour noise laws would help considerably.

In the longer term, sound insulation of properties would also help. We would like a programme of sound insulation to accompany the thermal insulation of properties, which would deal with noise and warmth at the same time. That is expensive and it cannot be done overnight, but start in the areas where noise is worst—local authorities know where they are, because they have to produce noise maps every few years—and with the properties that are experiencing the worst noise, and then move along. So things can be done. Some of them are quick wins, and some of them take a bit longer.

Lord Krebs: Before turning to Lisa, I will pick up on the transport point. You talked extensively about roads, but what about rail? Coming into London, to Paddington or Marylebone, as I do regularly—I am sure it is the same for other main stations—you go past miles and miles of houses and flats very close to railways lines. That must be dreadful for noise.

John Stewart: It can be, particularly if you are experiencing freight noise, because with freight trains it is not just the noise but the vibration, often at night. That problem will be difficult to tackle. When it comes to passenger trains, there are technical ways of improving the rails and the trains' wheels, which can reduce the noise quite considerably. In that case, it is a question of political will. But for freight trains and vibrations it will be difficult. We need to look at freight's operational hours, because I am not sure how much can be done technically to reduce the noise of the trains.

Lord Krebs: What about speed limits?

John Stewart: Yes, they would help no end. We have always called for lower speed limits where communities will be impacted. If a train is out in the countryside and not impacting anyone, it can move more quickly, but lower speed limits in built-up areas would help considerably and could be done relatively painlessly.

Lisa Lavia: On the last point about railway noise, the committee may be aware of the RSSB—the Railway Safety and Standards Board—which has a noise working group, which we are a member of. That has been sitting for some time, and it looks closely at advice that can be taken and given on how to practically reduce noise and have a much more holistic approach. I am happy to send some links, but it could be useful to refer back to it and get some of the information that it produces.

To John's point about solving some of these problems, the other thing I would add on rail noise is the announcements. Poor acoustics in railway stations are difficult for travellers, and the solution is often just to make them louder, which can affect surrounding communities badly. Also, the technology of the train horns is ear-splittingly loud and extremely upsetting to local communities if they have to hear them. They can be very alarming if you are a passenger standing on a platform when a train is going by and you are not prepared for it. They are a danger for people

with hearing difficulties or who are perhaps on the autistic spectrum. Those sorts of loud and sharp noises are extremely dangerous.

On quick wins, I will give the NAS's approach. In one sense, this is like trying to plug a hole in the side of a boat that is sinking, for lack of a better term: you plug the hole, but the boat still goes down for as long as we assess or try to deal with noise pollution based primarily on levels and noise at the source. It is one leg of a three-legged stool—you are dealing with one aspect, but you have two others: the human perceptual response and its contextual relevance, plus all the other objective and subjective indicators that we already know about. They significantly impact that 70% of the human response, but they are not being dealt with. So despite the best efforts of the engineering community to deal with noise at the source, which we applaud, there needs to be a balanced approach, because without that we will not make significant headway.

The problem with that is that good money gets spent on reducing noise at the source, but people still complain and there are still problems. That is the result of a lack of a holistic and co-ordinated response to solving the problem. So our one quick win is requiring soundscape design and plans in relation to every aspect of the built environment. That could be added to the *Noise Policy Statement for England*, for instance; it does not have to go into the level of depth that the Welsh Government have gone into. Fortunately, those documents could be referred to. But that would set an overt expectation for developers, planners and local authorities to feel covered, if you will, in taking action.

When we talk to stakeholders, they are aware that these new ways of doing things exist, but where is the incentive when consultants go into a bidding process? If you come in with a novel approach, they will think it looks silly compared to someone who is dealing just with noise control. How does a local authority assess that? How does it get support and experts to help it to do so?

Among the UK acoustics community, there is Arup—you heard from it—and the Association of Noise Consultants. I am on one of its committees—a soundscape working group—which looks to develop an industry-based response for how it transposes soundscape standards into its planning and design recommendations. But even it says, "We can see the need and the opportunity for innovation, advancement and solving problems for our clients and communities, but if we go in with a plan like this now, no one would know how to assess it and we would look way too expensive and like we are gold-plating our proposals".

So I suggest having an expectation of soundscape planning and management—either a yes or a no. If it is not going to be done and it is determined that it will be fixed as a noise-control problem, that is fine, but in most cases we know that it is not just a noise-control issue. Therefore, let us incentivise all stakeholders, including communities, to come together and work holistically to solve problems pragmatically at a local level, as John said. That will help the UK to build more of a corpus of practical evidence.

The Noise Abatement Society has run the John Connell Awards for 22 years. We have given about 300, mostly to organisations and individuals in the UK, including to John Stewart and Arup's SoundLab, which you heard about. We have given awards for practical, innovative and, unfortunately, novel solutions; they should not be novel. This is based on their holistic approach to solving noise. In one sense, for almost any problem, we know of a John Connell Award winner who has gone the extra mile and taken a holistic approach to solving it. So we know that it is possible, and we believe that the opportunity cost of not doing that for the UK is large, not just for human health but for innovation and development.

Q110 Lord Holmes of Richmond: Thank you for being with us. Are there significant gaps in the current regulatory framework for dealing with noise pollution, or is it a lack of resource for enforcement that makes the problem difficult to tackle?

Lisa Lavia: Briefly, the main issue holding back better solutions is the strategic policy framework, which sets the expectation for action to be taken on a more individualised case-by-case basis. That is the main thing that is missing.

John Stewart: It is largely a lack of resources and enforcement. In one or two areas, there needs to be a better regulatory framework. First, on wind-turbine noise, the ETSU guidelines are rather outdated, because they do not cover the large turbines that are going in. That needs to be looked at again. As I said, there needs to be a new and innovative regulatory framework for some of the sustainable energy measures that are coming in, as well as the drones and the flying taxis.

Lord Holmes of Richmond: Do you have a sense that this has fallen through the cracks between the government departments that should be gripping this?

John Stewart: That is a big problem, because so many departments have a finger in the noise pie, as it were. Lord Winston asked in the last session whether there should be a tsar for quiet and clear skies, and we have long thought that there should be a noise tsar. They would not just bring everything together but raise the profile of noise, putting a little pressure on government and local authorities to look at it more seriously and, to refer to your point, in a more co-ordinated way.

Q111 Viscount Hanworth: Lisa Lavia spoke of soundscapes. Could she explain the concept? I observe that we are talking about a soundscape, not a noisescape, so perhaps we might begin by anatomising the concept of noise. Can you define it in terms of its spectral decomposition on a spectrum of sounds? What is noise, as distinct from sound? It is not simply the intensity, is it?

Lisa Lavia: From a physical engineering perspective—I am not an engineer—and from a physics perspective, the term is "sound", and "noise" is a perceptual concept. So noise is unwanted sound, but the physical aspect of acoustic waves is sound-waves. In a sense, that is

what we should always refer to, but we are way downstream and the terms are used interchangeably and synonymously, which is incorrect.

"Soundscape" is defined by the international standards as the human perceptual response to sound in context. Therefore, it separates the human perceptual response from the acoustic environment, which is made up of a collection of sounds. The human perceptual response may be, "I like that sound, so I am happy about it and glad to experience it", or it may be, "I don't like it, or I don't like it at this particular time and place, so it's noise". That noise reaction triggers annoyance, which then triggers stress reactions in the body.

Viscount Hanworth: So it could be very subjective; different people have different reactions to various sounds. So how can you define a soundscape unequivocally? Presumably, you cannot define a standard that applies to all people.

Lisa Lavia: The standard has four parts, three of which have been published, and the fourth is under development. They are British standards. The standard is transdisciplinary and is based on a premise put forward by R Murray Schafer, a Canadian polymath and composer, who led the soundscape movement from the 70s. Everything in the environment has an acoustic signature, and from that basis he said that noise pollution is not inevitable; it is a lack of soundscape management. It is just like litter on the ground: someone has taken an action to do that rather than put it somewhere else.

So we end up with noise pollution because we are not starting with a strategic and holistic management of the acoustic environment that is intentional, as we would in a music hall, which is intentionally designed because there is an acknowledgement that the acoustic environment is important. Unfortunately, that does not extend to the built environment, but Schafer's premise is that it should. His thesis is that doing that effectively requires co-operation between what he referred to as "science, society and the arts" and what I have referred to as objective sciences—engineering and health sciences, "society": communities, humanities, and social sciences; and "the arts": design-based disciplines like architecture. The nexus of those coming together in parity allows for the design of something that is effective in context.

Viscount Hanworth: John, can you make a contribution to our enlightenment?

John Stewart: I probably cannot make as good a contribution as Lisa's, but I will try. The point that was made is interesting and, in some ways, is problematic in getting to a solution, because different people hear noise in different ways. Let me give you the example of Heathrow Airport. People live under the flight path. A young man I spoke to went to school under the flight path, a mile from the airport. Noise is not a problem; he has grown up with it. For somebody who lives 18 miles from the flight path, the noise is much less but is driving them crazy.

Individual reaction to noise is determined by a range of factors, which makes noise quite difficult to deal with, because different people respond

in different ways. Unfortunately, it also lets the authorities off the hook a bit, because they will say that somebody is “super-sensitive” to noise. There are people who are super-sensitive to noise, but that does not mean that their problem should not be addressed. You have hit the nail on the head: different people reacting to noise in different ways makes it much harder to find a solution and persuade the authorities to implement it.

Viscount Hanworth: Sound is a signal, which may mean very different things to different people. I did not realise how complicated it is.

John Stewart: That is exactly right.

The Chair: Could a soundscape approach make somewhere noisier, because irritation is the difference between the level of one noise and another? I am struggling a bit with the soundscape concept.

Lisa Lavia: I am happy to send some further information on the soundscape concept. I am a member of the Institute of Acoustics, on which I believe Lord Wei has asked for further information, so I have contributed on that but can send some other things.

This 70% is what we call “non-acoustic factors”. The only reason why soundscape seems difficult and somewhat opaque in relation to noise pollution is because most of the work to determine what constitutes a soundscape, and how to measure and assess it, has been done in research communities thus far. There has been very little practical work, but it is beginning to filter through. These other factors, this 70%, are measurable and assessable, because many of the principles are based on psychology, social science and mental health sciences, because non-acoustic factors relate to people’s perceptions and how they are feeling. There could be certain triggers, such as medical, mental health or emotional triggers. We have a base of knowledge across other disciplines, which is why I keep referring to the transdisciplinarity that is required to integrate that knowledge and triangulate it with objective noise measurements.

In addition to decibel measurements, we have to consider other characteristics of a sound wave—sharpness, roughness and tonality. Those things are hardly ever addressed in noise control, but they are accounted for. It is possible to measure a soundscape response, but we just do not do it very often, except in laboratories. It is possible and ways to do it are advancing.

In relation to how that is applicable now, there is a protocol in the soundscape standards for assessing a community’s response in relation to a development or proposal. Those responses use social surveys and psychology-based tools to do perceptual assessments of what people are thinking and feeling about a development, place or space. That can be applied to a triangulation process with objective measurements of the sound environment. That is assessed to give a recommendation, which is what the soundscape standards set out. I will not refer back to it completely, but this is detailed in the Welsh Government’s Technical Advice Note about how it could be applied in a context-based approach.

From that perspective, noise management is much more akin to the processes that are already used in landscape and biodiversity planning, which are already multidisciplinary and transdisciplinary in their approach.

It is difficult if we look at how things have been done in the past. However, if we look at changing the way we assess noise in the built environment and bringing in other disciplines to modernise our approach, it is easy to map out. It is perhaps not easy to do in practice, because it is not done, but it is being done; most of the large UK consultancies have soundscape experts, who are already doing this on certain projects. Some exemplars have done incredible work.

The Chair: It would be very interesting to have some examples of where this is actually being done in practice from you, with evidence—I do not know how it is measured—of how this has made a difference. Since you do not have a baseline, it is kind of hard to know, but it would be interesting for us to see that.

Lisa Lavia: Briefly—I will put this in writing as well—the baseline is whether there is community agreement on a development. We must think more about how something is being designed. Take a kitchen: certain things are required, but the design and how it is done may vary widely.

Q112 **Lord Borwick:** What are the major barriers to implementing better public policy on noise pollution in the UK? Do other countries do this more effectively? Am I right that the top barrier is the lack of clear medical research showing an adverse effect on human health?

John Stewart: You can rest for a second, Lisa. The northern European countries are really quite hot on noise and tend to be way ahead of the rest of Europe and perhaps the rest of the world. Germany, the Scandinavian countries and the Netherlands not only have fairly tight noise regulations but actually enforce them. We were talking earlier about whether enforcement is lacking. Go to Germany, the Netherlands and some of the Scandinavian countries and it will be very clear that a lot of this is due to lack of enforcement. I am glad to say that there are areas that we can copy, which would give local authorities confidence that it can actually be done.

On your other question, the medical research is getting better. The World Health Organization has done a lot of work on this and, again, a fair bit of work is being done in Germany and the Netherlands. My feeling is that there is always need for more medical research, because we can always discover more about the impacts of anything on our bodies. However, we probably have enough medical research to be able to get on with implementing some practical policies on noise. My real fear, as I said earlier, is that the authorities will hold back and say that they do not quite have all the definitive research. That is probably true, but they probably do not need all the definitive research to do much more than they are doing now.

Lisa Lavia: Starting on medical research, yes, more research is needed on objective health, but much more research is needed on subjective health, mental health and the indirect health pathway triggered by annoyance. Professor Clark referred to how that is beginning, but we are still at the early stages. It is very important to have more research on the sympathetic nervous system and those subjective and psychological aspects of noise response, so that we have a more holistic assessment of overall health. We take overall health as physical health and well-being, which leads to quality of life. It is important to have much more research on the indirect health pathways of noise. That is critical and will go some way to help demystify these subjective responses and how they fit into a soundscape assessment.

On regulation, we would like to see an expectation and emphasis from all government departments that this is done, which we are not seeing at the moment. Certain departments may target noise pollution but are not incorporating these other subjective elements. They can set a standard to call forth exemplar projects that could test these things in situ.

Lord Borwick: The medical research is absolutely clear that certain pollutants—air pollution, smoking and asbestos—are really bad for human health. The Government have definitely done work to reduce their effect. There does not seem to be the same research—double-blind, peer-reviewed research—that is absolutely clear that noise is bad for human health and therefore should be given equal priority to those other pollutants of which we know. Am I wrong in that analysis?

Lisa Lavia: With respect, I believe so. The World Health Organization has published two reports on the burden of disease from noise pollution, primarily focussed on the objective health impacts. The noise and health community is very clear that there is a link between noise and health, through the stress responses related to noise and how noise magnifies, increases or sometimes has a direct relation to objective health and disease.

The indirect pathway of annoyance, which triggers the sympathetic nervous system whereby people can be in a high state of continued stress for a long time, contributes to negative health effects. This is because, in the human mind, noise is first classified based on fight or flight. At a very subconscious level, the mind tries to make sense of a sound. If that sound is unwanted, disliked or not welcomed at that time, the mind, which is very objective, starts ringing a bell that says, "Tell me what to do with this". If that is not dealt with effectively, through the many ways it could be dealt with, the mind continues to send those stress signals because something is wrong. It is really important to understand that, because there is well-documented medical evidence of the impact on human health from living in a continued high state of stress.

The impacts of the other pollutants can be assessed objectively, which makes building a consistent, harmonised evidence base much more straightforward. As I have been saying, that is not the case with noise, because the human perceptual response accounts for up to 70% of the

issues, which are currently under researched. It is not that the evidence is not there; it is that the evidence is not harmonised, because noise is far more complex than other environmental pollutants.

John Stewart: I do not need to add anything to that. I am fine.

Lord Borwick: John, you gave two examples earlier of a child who has grown up with noise and was not affected by it and somebody who lived 18 miles away who was affected by it. Presumably, you would expect the effect of noise on their health to be different for the two people.

John Stewart: I think that is right. I think that is what the World Health Organization is saying: that annoyance from noise leads to stress. Ironically, the person who is 18 miles away is more likely to suffer ill-health effects than the person who is living almost on top of Heathrow Airport. This link between annoyance and health is crucial as far as the World Health Organization is concerned.

Also, as you said in your opening remarks, this makes noise more difficult than air pollution or other pollutants. This annoyance factor coming in is almost a trigger to bad health. You do not have that kind of intermediate factor with air pollution and some of the other pollutants, so this is a more complex business.

Lord Borwick: I understand.

Q113 **Lord Wei:** I am conscious that we are at the very end of the session, so if you need to respond to some of this at length, you can do so in writing.

I will take the liberty to ask something that I wanted to ask earlier. You have mentioned annoyance. Many younger people are using technology such as noise-cancellation headphones and ear buds, and there are other noise-cancellation technologies in the built environment. Is there scope to harness that, and could it change future policy and regulations so that an individual noise could be cut out when it is at its peak, rather than having to work out what to put in the wider environment?

Building on that, what are the key take-home recommendations that the Government should adopt to improve policy in this area?

Lisa Lavia: I will answer briefly now and reply in writing as well. As with any psychological or mental health challenge, there is a range of ways to address the problem, depending on the problem identification analysis. Non-acoustic factors have many dimensions. Sometimes they are physical or they might be objectively medical. Certain medications can cause hypersensitivity to noise, as could personality traits. There may be situational aspects of the built environment, such as something happening that makes it noisier outside than it used to be. If I am working from home more, I may notice more things.

One of the keys is education so that people can understand how to self-prescribe and understand what is happening to them, rather than those annoyance responses building up, which can be exasperating over time and, in the extreme, lead to trauma-based and PTSD-type responses. As with other mental health challenges or issues, it is important for people

to understand how to self-prescribe and to know when to get extra help if they need it. There are a range of potential responses, one of which is absolutely to wear ear-plugs in certain environments, if they are needed, or to play some background water sounds or what have you. They are not the only responses, but they certainly target one aspect of what can be done.

One of the things we would like to see is a form of education about sound starting from the early years. We have a programme called Love Your Ears, which tries to address this but, due to resources, is on a very small scale at this stage. The principle is that people, rather than potentially choosing to learn about acoustics through physics, will learn about acoustics from elements of those non-acoustic factors. A module of social-emotional learning, for example, would let people begin to understand that these things happen, how they could be affected, how they affect others and perhaps more positive ways to deal with them. That would go some way to helping to educate people, not just while they are young but as they get older. They could participate in noise discussions more collaboratively, as they would more innately understand what is happening subconsciously and how that can exasperate coming to effective solutions.

John Stewart: Quickly, because we are running out of time, I will address the second part of your question: what things we would like from government. I have three general things.

First, ensure that existing legislation, of which there is a fair bit, is properly implemented. Secondly, the Government need to come to an evidence-based position on new technology, particularly that surrounding energy developments. Thirdly, they need to put noise on a par with other pollutants.

Q114 The Chair: I will take my opportunity as chair to ask John a quick question. When you talked about easy wins from road noise, you talked about low-noise road surfaces but not barriers along the sides of motorways.

John Stewart: I did not talk about barriers, although I have written it down as my fourth point. Barriers work, but they are expensive. That is the problem with barriers. Our view is that barriers have a role to play but in very specific circumstances where noise is particularly loud. Motorways are the best example. If you go to Germany or the Netherlands, you will see many more noise barriers. They need to go in, because they can improve people's lives considerably, but at a cost.

The Chair: Thank you. It was useful to have that clarification. Thank you very much, both of you, for this interesting session.