

THE BOTTOM RUNG

Noise: the challenges, trends, technologies, politics and opportunities

Looking forward; seeking solutions

Summer 2019

The Heat Pump Revolution

Fossil fuel heating systems will not be allowed in new homes from 2025. Heat pumps will come in. We look at the impact on the noise climate.

The UK Government has said that fossil fuel heating systems – oil and gas boilers – will be outlawed in new homes from 2025. Their main replacement is likely to be heat pumps. These are like air conditioners which pump out heat. And most of them are situated outside.

There are significant noise concerns. Thomas Lefevre, the director of Etude, which was commissioned by the Greater London Authority to study heat pumps (1), said, “The noise coming out is not huge, but it is not negligible. People who say they will not introduce any noise risk at all are wrong.”

A report by the European Heat Pump Association admitted that the fan noise is a key problem. Mike Stigwood, the director of the consultancy MAS Environmental told the journal *Noise Bulletin* (2)

that the tonal and low-frequency noise from noise pumps would be a problem. Where they are located is also important but in flats the choice of location can be very limited indeed.

There is an expectation that the technology might improve as the mass market justifies and stimulates investment in quieter pumps but long-time noise campaigner Val Weedon said, “We simply cannot risk installing heat pumps in properties until we are certain they

will not cause noise problems. Otherwise their constant low-frequency noise will create untold misery.” Weedon added that it would be those on lowest incomes living in multi-occupancy properties and flats who are likely to be worst hit. “I sense that, in the rush to tackle climate emissions, the noise implications have not been thought through,” she said.

References:

(1). *Low carbon heat: heat pumps in London*

(2). *Noise Bulletin*, April 2019, has an excellent in-depth piece on wind pumps

Climate Change Uber Alles?

Climate change has shot to near the top of the political agenda in many countries. Extinction Rebellion is on the march. School children are skipping school to protest. Politicians and businesses are under pressure to act. However, there is a danger of a rush to adopt solutions that work for the climate but create problems elsewhere. It has happened before. In the 1990s politicians persuaded people to switch to diesel cars to cut CO₂ emissions without thinking through the impact it would have on air pollution. This edition of *The Bottom Rung* focuses on the technological solutions being forwarded to deal with climate and asks whether they work for noise as well or might make the noise climate worse.

This edition focuses on the technologies being promoted to deal with climate and asks whether they also work for noise or might make the noise climate worse

Our lead story features the real noise concerns there are as Government decrees we move way from fossil fuels to heat our homes to heat pumps. Our in-depth piece on pages 2 and 3 argues that the fashionable switch to electric cars will not be enough to tackle traffic noise, nor indeed many other aspects of current transport policy. Electric planes, still some way off, will not solve the problem of aircraft noise. Thermal insulation makes sense but should acoustic insulation not be improved at same time? We urge decision-makers to find solutions that work for climate and noise. Otherwise noise will forever remain on the bottom rung.

John Stewart
Editor *The Bottom Rung*

“*I sense that, in the rush to tackle climate emissions, the noise implications of heat pumps have not been thought through*”

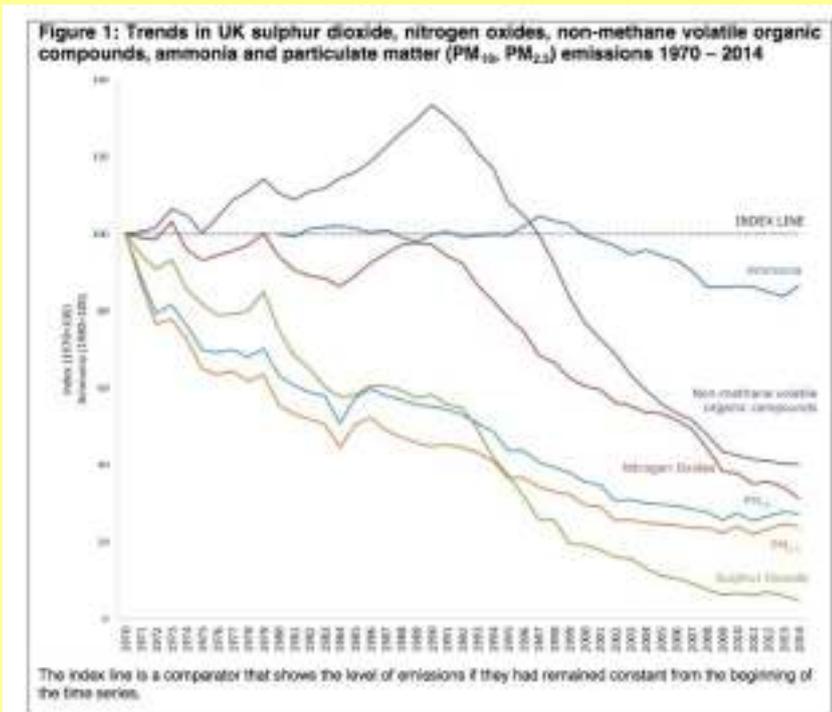
Electric Cars Plus

John Stewart argues electric vehicles are only a partial answer. On their own they won't do enough to cut noise or climate emissions. Nor will they sort out other key transport problems we face.

Electric vehicles are good things. They are an example of innovative technology once again helping us deal with real problems. Electric vehicles will help reduce air pollution, noise and cut carbon emissions.

Air Pollution

It is easy to forget that air pollution levels have fallen dramatically since 1970. And figures from the Office of National Statistics show that the pollutants from motor vehicles actually dropped 12% in the four years between 2012 and 2016. But despite that, road transport accounted for 49% of air pollution in 2016. A study from Oxford University (1) published last year estimated that the health and other costs of air pollution from traffic costs the UK economy about £6bn each year. However, it urges caution about the figure as there is not agreement on how much 'premature deaths' should be valued at. This is important as a lot of the economic costs of air pollution are from 'premature deaths', i.e. people dying earlier than they would have



done - typically 6 months earlier – due to air pollution. The study estimated the health damage associated with electric vehicles is around 20 times less than diesel ones because battery electric cars produce zero tailpipe emissions (but are liable to non-tailpipe emissions from tyre, brake and road wear, just like conventional fossil fuel vehicles). There is little doubt electric vehicles will cut air pollution levels.

Climate Change

Cars and lorries are a major cause of CO₂ emissions. According to Government figures (2) transport accounts for 27% of total UK emissions; 33% if international aviation and shipping are included. Moreover, while total CO₂ emissions have fallen significantly since 1970 from 594.1Mt CO₂e to 333.9Mt CO₂e, emissions from transport have remained about the same. Cars account for 57% of the transport emissions (excl. international aviation and shipping) and lorries and vans 31% of it.

Will electric vehicles change things? They will help but are only a partial answer. The carbon emissions of driving 10,000 miles in an average electric vehicle is 0.96t CO₂e compared to 2.99t CO₂e in a petrol car and 2.88t CO₂e in a diesel car (3). While no greenhouse gas emissions directly come from electric vehicles, they run on electricity that is, in large part, still produced from fossil fuels in many parts of the world. Energy is also used to manufacture the vehicle – and, in particular, the battery (4). If energy sources decarbonise, electric vehicles will contribute more to CO₂ reductions, but at present they are only part of the answer.

A new report (5) suggests that the level of traffic reduction needed by 2030 to achieve meaningful reductions in CO₂ could be anywhere between 20% and 60%, depending on a number of factors including the speed of the switch to electric vehicles and how fast the electricity powering them is decarbonised. The report, commissioned by Friends of the Earth from Transport for Quality of Life, argues there is scope for a significant switch to other modes of transport, particularly in urban areas but says that rural areas must be tackled as well.

Electric vehicles alone are not enough; there needs to be at least a 20% cut in traffic to meet climate targets, says new report

Noise

Electric vehicles are part of the answer to cutting the noise on the roads but no more than that

Vehicle noise is created by a combination of rolling noise (arising from the tyres interacting with the road) and propulsion noise (comprising engine noise, exhaust systems, transmissions and brakes). As a rule of thumb, tyre-road interaction is the main source of noise above 25 - 35mph for cars and above about 40 - 43mph for lorries, with engine noise predominating at lower speeds. Electric cars will cut engine noise. At very low speeds the cars will be very quiet; and remain less noisy than conventional vehicles until they reach between 25 to 35mph. They will be so quiet at the lowest speeds that both the EU and America are requiring artificial noise to be added to warn people of an approaching vehicle. As with CO₂ emissions, electric vehicles are part of the answer to cutting noise on the roads but no more than that.

Lower speeds will cut noise

Governments have always been wary that reduced speed limits will provoke a motorist backlash. But they are the fastest and most equitable way to cut noise and road danger. Lower speeds will allow for the noise benefits of electric cars to be spread more widely. If the speed limit in all built-up areas was to be 25mph or less, the introduction of electric vehicles would dramatically reduce noise levels for the vast majority of households in the UK. But noise would remain high elsewhere unless higher speed limits were cut. Tyre-road noise, which will still be a problem even with electric vehicles, increases strongly with speed, around 12 dB(A) for a doubling of speed. Since a 10 dB(A) rise doubles the perceived loudness it means that a vehicle travelling at 60mph is twice noisy as one going at 30mph. There are also other benefits of lower speeds. A 5% increase in average speed leads to approximately a 10% increase in all injury-related crashes and a 20% increase in fatal ones. The relationship between climate emissions and speed is more complex. CO₂ emissions are highest at speeds of less than 20mph after which they level off before rising a little at speeds above 50mph. The argument is sometimes made that lower speeds will damage the economy as it will slow down freight lorries and people driving on business. This argument is given little credence in a comprehensive report on speed from the RAC Foundation (9). It found that 'journey-time savings are often small' and that congestion was the real problem, quoting the study by Sir Rod Eddington into the long-term links between transport and the UK's economic productivity which concluded that 'eliminating existing congestion on the road network would be worth some £7–8 billion of GDP per year.'

Is traffic reduction necessary and feasible?

As we saw, the Transport for Quality of Life report found climate emissions from vehicles won't meet their CO₂ target without traffic reduction. What about noise? Fewer vehicles on the roads will reduce noise but not as much as might be thought. 200 vehicles passing in one hour will sound half as loud as 2000 vehicles. So volumes need to fall fairly significantly to have a noticeable effect but my guess is most people living beside busy roads would welcome any reduction in noise levels. There is, though, one important caveat to make: traffic noise will not fall automatically with a drop in vehicle numbers if it simply allows the remaining traffic to speed up. Speed reduction remains crucial.

How feasible is traffic reduction? As people have become wealthier and as the population has grown, the ownership and use of cars has increased significantly in the UK. But these have not been the only factors driving the increase. Planning decisions where business and recreational facilities have been located out of town have made them more car-dependent. Cost has played a role too. Between 1980 and 2016, the cost of bus and coach travel rose by 64% and rail travel by 63% while in real terms the cost of motoring, including the purchase of the vehicle, fell by 20% (6). But there are signs that things are changing. Towns and cities across Europe are looking at ways of reducing the dominance of the car, driven not just by environmental concerns but also by the cost of congestion and the numbers killed on the roads each year. In future editions we will look at ways of reducing traffic levels.

John Stewart has worked in the transport and noise fields for over 35 years. Currently he is vice chair of Campaign for Better Transport, chairs Cut Noise and works for HACAN (which gives a voice to residents under the Heathrow flight paths).

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Electric Planes



They could be here sooner than we think but might do little for noise.....

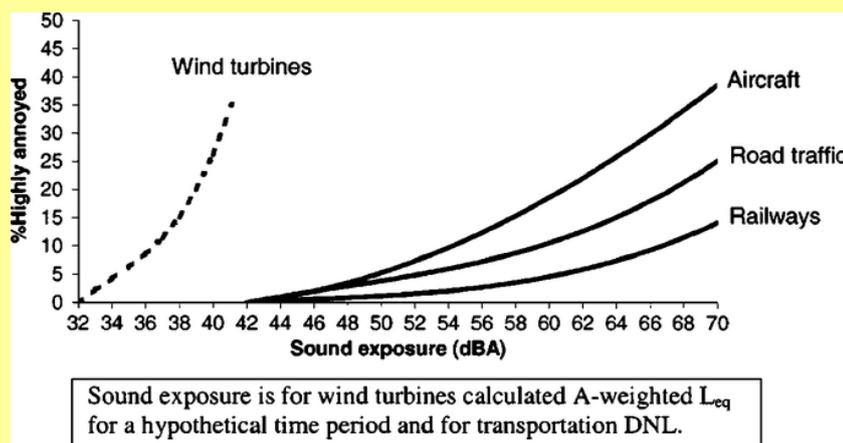
In less than 20 years electric planes could be using our airports. A new report (1) from the CAA (Civil Aviation Authority) suggests some short-haul flights could be using electric aircraft by the early 2030s. However, the larger long-haul planes are not expected to be electrified until at least 2050. Electric aircraft would reduce the air pollution and climate emissions coming out of each plane. But there is much more doubt about their noise benefits. The report says “There is still a clear need to undertake noise measurements of the full scale commercial electric planes once they are available to fully understand their noise characteristics” adding “it is still unknown whether the noise exposure from electric aircraft will be an improvement from conventional aircraft.”

“It is still unknown whether the noise exposure from electric aircraft will be an improvement from conventional aircraft.” Civil Aviation Authority

The CAA report identifies the main sources of the potential noise from a fully electric plane. They are the battery systems, the motor and air frame. Early modelling suggests that the planes may be quieter on departure than current aircraft but noisier on arrival. But, because of their batteries, they will be heavy and are expected to climb more slowly after take-off which might off-set any noise gains at source. All of this would be problematic for communities under flight paths. The technology which could clean up the industry could make things worse for them. Communities will be concerned that, driven by the need to cut emissions, the aviation industry may be rushing into a technology which may do little or nothing for noise. It is likely to renew calls for research into other technologies and for demand management measures to be put in place in the meantime.

CAA report: <http://publicapps.caa.co.uk/docs/33/CAP1766EmergingAircraftTechnologiesandtheirpotentialnoiseimpact.pdf>

A Lesson from Wind Farms?



Over the past decades governments rushed in to support and subsidise wind farms as clean technology. But the rush led to real noise problems as turbines were sited too close to properties. Wind farm noise is no longer in doubt. It is recognized by the World Health Organisation. As the chart shows, people become more annoyed by wind turbine noise at lower levels than by other noises, due to its high low-frequency content. A lesson to be learnt: think about *all* the impacts of new clean technologies very carefully?

Listen Out!

- the chance for you to sound off!

Extinction Rebellion: so much to answer for!

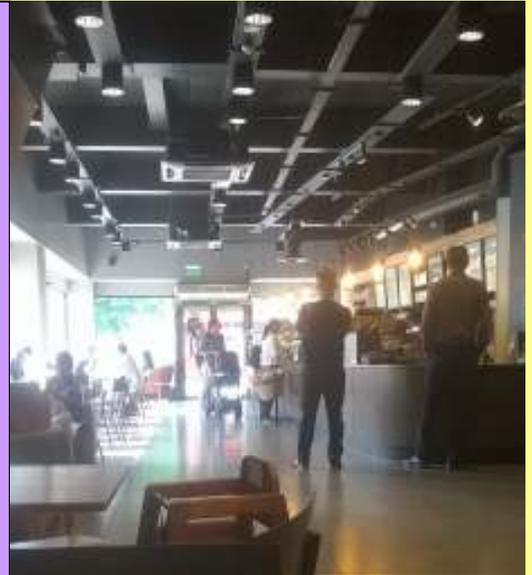
My strapping 15 year old son bunked off school the other week to join Extinction Rebellion! I told him I *strongly* disapproved but I could tell he knew I didn't really mean it. I was left meekly murmuring that he shouldn't get arrested. *Oh you are so old-fashioned mum*, he responded, *the whole point of modern demos is to be arrested*. He did return – a vegan! I told him that it would harm his football performances. He was having none of it. Apparently Barny du Plessis (no me neither), a top bodybuilder who was Mr Universe 2014, is a vegan. Don't you hate the internet sometimes!

I've come to admire Extinction Rebellion. Their dedication to their cause is absolute. My campaigning against noise planes is part-time. No wonder they have put climate top of the agenda

And now every weekend, every Bank Holiday, he is emailing his mates at Extinction Rebellion. And I've got to say I've got a grudging admiration for him – and them. They put me to shame. I've been sounding off for some years about the noise of the aircraft going over my house. And I know a lot of people in the same position as myself. But we are not dedicated like Extinction Rebellion. They have a cause that is bigger than themselves. We have a noise problem, albeit a serious one, but we see our campaigning as an interruption to our lives. Once our local problem goes away, we go back to our daily routines. In my case digging out vegan cook books. Do real men eat *vegan* quiches?

Jan lives under the flight path to Heathrow. Her son insisted she didn't use her real name!

- *Listen Out!* is an opportunity for people with a strong opinion on a noise matter to have their say. Have your say!



Starbucks. Not any old Starbucks. The one in Chiswick, West London and one of the few that doesn't play background music. To find a great list of venues free of background music check out <https://quietcorners.org.uk/> run by the admirable Pipedown.

Help! I've got a noise problem!

You can contact:

The Noise Abatement Society
<http://noiseabatementociety.com/>

Helpline on 01273 823 850;
email info@noise-abatement.org

The Noise Abatement Society also carries out a range of activities including research and lobbying

Or contact **Noise Nuisance**
<https://noisenuisance.org/>



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overheard

'We have a noise footprint like we have a carbon footprint'

Mathias Basner, TED talk