

## London Assembly Environment Committee – Wednesday 16 January 2019

### Transcript of Item 6 – Air Pollution in London

**Caroline Russell AM (Chair):** That brings us to the main agenda item, looking at air pollution in London.

I would like to welcome our guests. We have Elliot Treharne, who is Head of Air Quality for the Greater London Authority (GLA); we have Stephen Inch, who is a Senior Policy and Programme Officer here at the GLA; and we have Professor Martin Williams, who is a Professor in Air Quality Research at King's College London. Welcome to all of you.

This is all very timely. We have just had the Government publish its Air Quality Strategy. We have the Ultra Low Emission Zone (ULEZ) getting started pretty soon. Also, there is a lot of interest in the media in the health impacts of air pollution.

What progress the Mayor is making towards his new particulate targets.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** It is worth starting by saying that improving air quality is a big challenge and has been identified as a huge priority for the Mayor. If you do not mind, I will also talk a little bit about nitrogen dioxide (NO<sub>2</sub>). Often some of the interventions we are doing are actually going to deliver co-benefits in terms of tackling not just NO<sub>2</sub> but also particulate matter (PM) and also, crucially, carbon dioxide (CO<sub>2</sub>) given that we have adopted an integrated approach to tackling these emissions. As you know, there have been some very significant results and improvement, thanks to the Mayor's efforts. Assembly Member Cooper in particular will be aware of the benefits of some of the low-emission bus zones that have been delivered, which have seen some very significant reductions in concentrations of NO<sub>2</sub>.

On PMs, the ULEZ is expected to have a significant impact in terms of exhaust emissions and we are expecting the central London ULEZ to help reduce those emissions by around 60%. However, I am sure many Members of the Committee will be aware that the Mayor has been talking for some time about the importance of ensuring he has the right powers to tackle all emissions, not just transport emissions. When we come to PM, in particular, there is a significant challenge that comes in terms of construction contributions from tyre and brake wear and from wood burning. The Mayor has set out quite clearly that additional powers will be needed in order for London to have the ambitious policies needed to achieve the commitment he has set out in the London Environment Strategy of achieving the World Health Organisation (WHO) recommended guidelines by 2030.

There is definitely a lot of progress being made on improving air quality, particularly NO<sub>2</sub>. There will be further improvements to come in terms of PM but we are the first to recognise that without additional powers, achieving the WHO recommendations is challenging.

**Caroline Russell AM (Chair):** Am I right in understanding that you are not going to be able to meet the target for the WHO guideline by 2030?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** No, that is not what I said. What I said is that, in order to achieve it, there needs to be the right additional powers in place so that the Mayor can

tackle as effectively as possible all the different sources in London and so that local boroughs can take similar action, but as the [Mayor's] London Environment Strategy makes it very clear, this has always been in the context of a co-ordinated national approach with additional national action and the right powers and new legislation.

As you are aware, we are currently in a process whereby the Government has published a Strategy [The Air Quality Strategy] that makes a lot of the right noises but does not actually have the right detail in it yet. We know that the forthcoming clean air legislation is going to be absolutely critical in terms of ensuring we have the right powers to meet those 2030 WHO objectives. They are achievable, but we need those powers.

**Caroline Russell AM (Chair):** What specifically are those powers that you do not have at the moment that would enable you to meet these?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Again, as set out in the London Environment Strategy, there is a whole range of additional powers we have been seeking, particularly around construction. Of course the Mayor has used, through the planning system, the powers he does have in terms of trying to tackle emissions from construction, but he wants to go much further and would be able to do that if he had ULEZ-style powers over construction sites.

In terms of wood burning and building emissions, the Mayor has also set out additional powers: he wants to be able to set emission standards for new equipment going in, for example, wood burning stoves, so that he can make sure those standards reflect London's particular needs to meet that very challenging target of WHO limits.

On tyre and brake wear, again, we need the ability to work with manufacturers and, again, we would expect the Government to do a lot of this work but we are also picking this up through things like [Go Ultra] Low City [Scheme], which is our partnership with industry, to try to ensure that tyre and brake wear is tackled, particularly through the integration of the right regenerative braking technology into new electric vehicles, which we think will pay dividends because it will start tackling some of the tyre wear, which contributes to levels of PM less than 2.5 microns in diameter (PM2.5). They are a few examples of the powers that we are looking for or the additional action that we are looking for.

**Caroline Russell AM (Chair):** Those are the powers that you are seeking. Do you have views about the way that London's roadside PM2.5 levels seem to be flattening out at the moment? They are not coming down fast enough.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** We are actually in the process of doing some more work to understand that. When we publish the new London Atmospheric Emissions Inventory later this year [2019] we will probably have a better understanding of what exactly is going on.

As I say, I do take the point that we need to do much more and that involves having the correct powers, but progress has actually been seen in recent years in terms of some of those PM2.5 levels, partly because of some of the work that has happened around taxis, particularly retiring some of the older taxis through the taxi age limit. There have been significant improvements in terms of bus emissions and other vehicle emissions through more effective PM control equipment on vehicles. You are very well aware, I know, of some of the issues in terms of Euro standards for NO<sub>2</sub>. We have seen less of those in terms of the vehicle fleet.

As you know, with Euro V and Euro IV, the expected reductions we were hoping for in terms of nitrogen oxides (NOx) emissions from vehicles did not quite transpire and there have been some issues with Euro V where you

can actually have increased nitrogen oxide (NOx) emissions. However, generally speaking, we have seen positive progress through the emission standards in terms of PM emissions.

We will have to wait until we have completed that work before I can comment definitively, but I would say that significant progress has been made in the past. However, obviously, as I was explaining a few minutes ago, additional work and those new powers are also crucial to continuing the progress that we all want to see and to making sure we achieve those WHO limit values.

**Caroline Russell AM (Chair):** At the moment, every tyre that is rolling on the road is producing PM2.5s, which are damaging to Londoners' health. Do you think that Londoners understand the seriousness of that health impact and that, given that we do not have these future vehicles at the moment, every decision to drive less is helping their own health and other people's health?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** You have also highlighted one of the key planks of the general plan to tackle PM2.5 emissions, especially from tyre and brake wear. As you know, in the Mayor's Transport Strategy there are very ambitious targets around ensuring mode-shift towards walking, cycling and public transport to reduce the dominance of the car and, as a result of that, to deliver some of those improvements. That could be explained to people in a whole variety of ways, particularly in terms of the wider health impacts that you have, more walking and cycling, and a more pleasant community and urban realm.

Absolutely, it is fair to say that we can do more to explain around PM2.5. The Mayor has already put a huge focus in terms of explaining and communicating the impact of air pollution, not least through his support of various bits of scientific research and in partnership with organisations like King's [College London] - I imagine Professor Williams will talk about that in the time being - and also, crucially, in the provision of the alert service, which gets information out there.

Once people start to understand in general terms that air pollution is such a significant challenge and that it impacts their health, that also opens the way in terms of some of those wider behaviour-change messages that are getting out more generally as part of the Healthy Streets initiative and also on tyre and brake wear specifically.

**Caroline Russell AM (Chair):** I would like us to look at what the Mayor is doing particularly to help vulnerable Londoners to reduce their exposure to air pollution. Professor Williams, would you like to come in at this point in terms of exposure to air pollution and protecting people, particularly children and older people who may have lung and heart health problems?

**Professor Martin Williams (Air Quality Research, King's College London):** Yes. Let me just backtrack maybe on the question you asked previously about whether Londoners understand. Looking across the United Kingdom (UK) as a whole, I have not exhaustively trawled people but my sense is that Londoners are probably much better informed than in most cities elsewhere in the UK, not least through the activities of the Mayor but also in the media there is a much higher profile of air quality and health issues in London than in most other cities in the UK. That is not to say that we could not do better, obviously, but we are in a pretty good place.

In terms of exposure, yes, there has been a lot of work not just at King's but elsewhere showing the numbers of schools and hospitals that are located in situations with high pollution levels. That has to be recognised and dealt with. I happened to be at a meeting in Brussels yesterday where another country in the European Union (EU), where we still are, was making the point that one ought not apply annual average concentrations to

places near busy roads because people do not spend more than an hour or so there. That argument is being voiced elsewhere in Europe but fortunately we in the UK - certainly in London - do not take that view. A long-term average, which is what the PM2.5 WHO guideline is all about, is very relevant to places like schools and hospitals and habitation near roads. Those sorts of situations are ones that we really do need to protect and keep an eye on.

**Caroline Russell AM (Chair):** You have talked about the annual average and the annual exposure, but there are periods when there are peaks and when we get many more hospital admissions for asthma and we hear that there are effects on people's heart health that follow these peaks. How are we making sure that Londoners know how to protect themselves when the pollution is likely to be more damaging?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If you do not mind me jumping in here, it is a very important point that you are raising and it is very important that people have that information, which is why the Mayor of course, shortly after entering office, did launch the [public] alerts programme that we have, which provides information through a number of channels.

For example, for high and very high pollution alerts, we mobilise the entire communications framework we have within Transport for London (TfL). That includes things like bus countdown signs and the variable message signs next to roads. It includes information at the entries to Tube stations. That provides information about there being a pollution episode and then links people to a website where they can get hold of that information and health advice.

There are also now direct emails that go to nearly every school in London in terms of moderate, high and very high pollution episodes. Again, that provides relevant health advice particularly for children.

There is also the airText service, which is probably more for people who have existing health conditions. It will provide text information about whether there is pollution and what the pollution levels are. That, again, provides a mechanism for going to check what the relevant health advice is.

Therefore, yes, in reference to that first part in terms of providing information, a lot of work has taken place on that to make sure that during, as you say, some of those peaks, information gets out there; although you are also right and Professor Williams is right that, with the average levels, the ongoing exposure that people have every day to air pollution also has health impacts. It is important that we do not try to make this just about the peaks. It is about the everyday exposure as well.

**Caroline Russell AM (Chair):** Do you think you should be using the peaks to really drive behaviour change? The peaks come about, presumably, from a whole mixture of sources, but transport particle pollution is very much part of that and in the mix. The information to Londoners about the peaks is very much at the moment, as I understand it, targeted to the vulnerable people who might come to harm breathing that bad air, but would it not also make sense to be using that as an opportunity to alert Londoners that every time they use their car, while cars are the technology that they are at the moment, they are contributing to poisoning the air that we are all breathing?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** In terms of the enhanced functionality I was just talking about, the duty forecaster service where we contact schools, we are coming up to the first year of the operation of that and so we are doing a review to understand how effective it is and to understand whether the messages are calibrated in the right way so that the right information is getting across to people as quickly as possible. As part of that - and I know you have asked Mayor's Questions about this and it is something we have taken on board - we are considering if there are those behaviour-change messages

we could also issue at the same time through the same kind of platform that I was talking about, which does have quite a wide reach to Londoners. Absolutely, that is something that we are considering and that we are looking at.

**Caroline Russell AM (Chair):** Do you think that the measures are working for the most vulnerable, particularly children - you have talked about the school messages - and also for older people? Do you think you are reaching the people whose health is being impacted?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** This very much explains some of our recent efforts to start targeting those kinds of organisations where children are most likely to be located; obviously schools, for example, but we are looking at what other institutions we could work with. It is very important to make sure that we do try to target those messages as effectively as we possibly can.

**Caroline Russell AM (Chair):** The Mayor's Strategies are all very un-siloed and it has been very good to see how the Strategies have been interlinking across each other. How does the air pollution work intersect with the Health Inequalities Strategy?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is the other thing that is probably really important to highlight. You have seen a step change in the interest both at a national level, in fairness, and also, crucially, within London over the last few years in terms of the involvement of the health community. Directors of Public Health have recognised this as a major issue. We did a lot of work trying to work with those public health professionals to get this into things like the Joint Strategic Needs Assessments that take place for each of the areas for which a Director of Public Health has responsibility. [Professor] Yvonne Doyle CB, who is the Public Health England lead for London and the Mayor's Statutory Health Advisor, has been a real champion of this issue. They have been able to start highlighting potential mechanisms for working with health professionals - general practitioners are a really good example, but also through various different clinics at hospitals - in terms of trying to raise awareness of the issue more generally and publicise some of the tools and resources that are available, like the ones I was just explaining and the alert system.

**Shaun Bailey AM:** Just a few small things. Firstly, we see the powers you are requesting around tyres and brakes. Could you explain that to me? That seems like something that would almost need to be dealt with at an international level. How much leverage would we have over things that are produced internationally by huge companies?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is a really key point and you are exactly right in terms of our ability to influence big manufacturers. We have to work together. You might be aware of some of the work previously that we have been doing in terms of trying to address bus premiums. We created a coalition of international cities in order to drive down the premiums we were paying for some of these new hybrid and electric buses. We are adopting the same approach with other cities through the C40 network of cities to try to develop a common approach across cities about what we are hoping to achieve in terms of technology and what our concerns are, highlighting the importance of achieving those WHO objectives, and then through pooling our influence, basically, trying to engage directly with the manufacturers about some of the technological changes and where research and development need to go. As I said, we have had successful roadmap reviews previously with the bus manufacturers and the bus industry, and we are hoping to replicate that with this.

**Shaun Bailey AM:** Is that not slightly different? In that sense, we are the customer. In another sense, we would just be lobbying. We are not the customer. We collectively do not buy cars. Of course we collectively

buy buses and so we have greater leverage there. Is this something that should be done in partnership with the Government?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Absolutely. Perhaps when it was referred to, “tyre and brake wear” is a bit more nuanced than just a power. It is about a co-ordinated set of actions, absolutely which involves the Government. Historically we have had also the EU playing quite a big role in terms of, again, trying to set tyre standards and all the rest of it and, obviously, in the context of Brexit, we are going to have to ensure that the Government steps in and ensures that we have a robust framework for the UK.

**Shaun Bailey AM:** I just ask because you say it is more than a power but it has been presented to us as asking for a power, which muddies the waters because we cannot deliver this. This needs to be delivered by national governments internationally, and so we should not be asking for it as a power. It will make it harder to achieve all our other goals that we could achieve because it is one extra thing for someone to say no to.

**Leonie Cooper AM (Deputy Chair):** I do believe that the Mayor has spent a lot of time raising awareness about the health impacts of air pollution, but I am still unconvinced that the media takes it as seriously as, for example, knife crime, which gets endless amounts of coverage. I am absolutely not saying that deaths caused by knife crime or gun crime on our streets, or indeed in domestic settings, or anywhere else are not important, but approximately 150 knife or gun crimes get far more media attention than 9,000 deaths in this city due to air pollution, let alone the impact on children’s lungs, which are stunted not just this week but permanently, chronic health conditions like chronic obstructive pulmonary disorder, and the nanoparticles that we now know with better research are causing brain cancer and cancer in other organs of the body.

Do you think there is anything else that can be done? There are also some politicians who are not taking this seriously, either. Is there anything more that we can do to raise awareness of the health impacts and what I believe - I completely agree with the Mayor - is a public health emergency here? I still think it has not got through to everybody. Is there anything else we could do?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** The first thing to say is that knife crime is a massive priority for the Mayor and every death is a total tragedy and needs to be avoided.

**Leonie Cooper AM (Deputy Chair):** Of course.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Separately, obviously, the health impacts from air pollution are a massive priority as well for the Mayor in terms of the impacts you were setting out, which are over the course of our lives. As you said, the Mayor has recognised that as a public health emergency. The evidence you were talking about continues to grow and I am sure Professor Williams might want to jump in in a moment to talk a bit more about that. It is very important that we tackle air quality to protect public health. That is what the Mayor has set out to do and what the Mayor is achieving.

**Leonie Cooper AM (Deputy Chair):** The Government has introduced a Clean Air Fund, to which we have no access, and, frankly, it is tiny at £200 million. It does not really seem to me that, beyond the Mayor, we have proper buy-in from politicians. Is there anything else that you think we can do, Professor Williams?

**Professor Martin Williams (Air Quality Research, King’s College London):** Maybe I should declare an interest here. I used to head the Air Quality Programme in the Department for the Environment, Food and Rural Affairs (Defra) about eight years ago. There is a limit beyond which you cannot go in influencing the media, as you might imagine. You can provide the information and you can put out press releases and feed

stories but ultimately it is an editorial decision both in newspapers and in the broadcast media. There are limits there that we face in a free-press democracy.

That said, there is emerging evidence all the time, as you say, of pollution effects on different illnesses and different parts of the body like the brain, recent work on dementia and other neurological issues. One can make the most of those and latch on to each of those pieces of new research that come out to raise the profile and to make people aware of how wide the dangers are from air pollution exposure. That is one thing you can do, as well as all of the other things that Elliot has already mentioned like feeding the press with all of the actions that are going on and continuing to raise the profile of the high number of premature deaths associated with air pollution. Just keep banging the drum, basically.

**Leonie Cooper AM (Deputy Chair):** I just want to build on something else that the Chair was mentioning in her previous remarks and Elliot alluded to as well, which is the issue about tyre and brake wear. Our understanding of nanoparticles, whether they be plastic microbeads, and our understanding of these very small particles and their impact on our health and the health of all the other fauna on the planet has been growing exponentially, but I am not sure as yet whether the move towards electric vehicles completely takes on board the issues relating to the nanoparticles that still flow from the braking and the tyre wear.

For example, in one of the boroughs that I represent a major thrust of air quality improvement planning has been around the need to get a big electric network so that we can shift all of our residents away from driving internal combustion engine vehicles, which obviously will deal with the emissions from the internal combustion engines but is not going to be dealing with the tyre wear and also the other health benefits that you get from moving towards a true embrace of the Mayor's Transport Strategy with 80% using public transport, walking or cycling.

Is there anything else that we can do to really start to emphasise the impact of those particles and where the Chair's questions began in the first place? I know we spoke about having a ULEZ rather than having a ban on diesel and you came in with Shirley Rodrigues [Deputy Mayor for Environment and Energy] and we had quite an intense discussion about other cities that were saying, "Let us completely ban diesel", but we did not want to drive people away from diesel towards petrol. I am slightly concerned that we might be driving people away from internal combustion engines but towards electric vehicles too much and not embracing the Mayor's Transport Strategy sufficiently.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is a point that was very well made. Just to restate, in terms of the hierarchy of action, the Mayor's Transport Strategy is very clear about the mode-shift and the achievement of the 80% target. Encouraging people to use public transport, to walk and to cycle is absolutely the priority. Obviously, the Mayor also recognises that there is a role for vehicles and that some journeys will have to be made by vehicles.

In terms of the approach we have adopted in the [Transport] Strategy, once we have achieved the 80% mode-share target and we do have more people walking, cycling and using public transport, for those who still need to use a vehicle, the point is to try to switch those to electric or to zero-emission. It is very important, as you say, that we build into that approach - also to Shaun's [Bailey AM] point as well, which is a very important one - making sure that we are getting the right technology built in so that we do minimise any other impacts from things like tyre and brake wear or the wider impacts of having a vehicle. That is very important.

On the other thing that we were saying in terms of raising awareness of it, that work is starting to take place. We talked a huge amount about NO<sub>2</sub>. The Mayor and the WHO in particular have started to talk much more about PM2.5s and about the difference between the legal standards for PM2.5s compared to the

recommended health-based guidelines produced by the WHO. They are very different. As we start to try to get that message across and people start to realise just how much of London is not in conformity with those WHO recommended guidelines, it will be a spur to the next stage of action in terms of improving air quality.

**Professor Martin Williams (Air Quality Research, King's College London):** Can I just say something on electric vehicles? Sure, the first step ought to be to minimise the use of any kind of vehicle, particularly internal combustion engine ones, but I am a fan of electric vehicles. If you are going to change cars, change to electric. The main source of ultra-fine particles currently in London is probably motor vehicle internal combustion and the exhaust emissions.

The non-exhaust emissions are tyre and brake wear from electric vehicles. There are good reasons to think they might actually be lower than from conventional vehicles. The science is pretty uncertain and there is not much information around but there are indications that in regenerative braking, as it is called, where the engine does the braking rather than the discs on the brake drums, if the engine is doing the braking 50% of the time then potentially you are going to get 50% less emissions from brake wear. The big question is whether that "if" is going to actually happen. As I say, there is very little information on that out there but there are indications that it might reduce tyre and brake wear. Not so much tyre wear, I guess, but brake wear might be reduced if you go to regenerative braking with electric vehicles.

**Leonie Cooper AM (Deputy Chair):** That is interesting but I think we have also heard the opposite evidence about tyre wear, that because electric vehicles tend to be heavier there might be more tyre wear.

**Professor Martin Williams (Air Quality Research, King's College London):** That is the uncertainty.

**Leonie Cooper AM (Deputy Chair):** The point I am making is not that we should ban electric vehicles. For example, I personally quite like car clubs, where they have been established, to have a minimum percentage, so that you say, "If you are going to have a car club at least 50% of the vehicles now must be electric, and in five years' time they should all be electric". I would quite like to set some very firm targets like that. I am not completely against electric vehicles, I am just concerned that to reduce vehicle use to 20%, with the 80% in the Mayor's Strategy for everything else, we might need to be developing our thinking around this a little bit more.

**Caroline Russell AM (Chair):** I think Tony [Arbour AM] would like to come in.

**Tony Arbour AM:** Professor Williams, you have just repeated that the principal cause of pollution is the combustion engine, being near highways and so on. We have heard from Elliot about the Mayor's attempts to raise public awareness of this. Can I ask you, Professor, what your views are on the increase of - if I can put it this way - 'boulevard London'? There are more and more coffee shops and eating places on the edge of major highways and there are increasing numbers of people sitting there, presumably intelligent people. In my constituency, for example, on Chiswick High Road you cannot move along the pavements because of people sitting out at tables and eating. You have stationary traffic jams there. I guess many of the people who eat at these places read the newspapers, possibly read *The Guardian* [British Newspaper] and are aware of these matters. What do you think should be done about that? Perhaps you do not think that people eating in cafes on the highways are affected by pollution.

**Professor Martin Williams (Air Quality Research, King's College London):** They clearly are. I personally would not do it. That is back to this whole issue we have been talking about of public information and raising awareness. If you were to mount a campaign then you might want to use that kind of example as



part of it. You would need to be pretty careful about offending commercial interests and leaving yourself open to challenge but that is the sort of thing one might want to --

**Caroline Russell AM (Chair):** Can I just come in here? Are you suggesting that public policy should be about stopping people eating in the restaurants or are you suggesting that we should be reducing the pollution coming from the road traffic?

**Professor Martin Williams (Air Quality Research, King's College London):** Well, both, but certainly reducing the pollution coming from the road traffic. I am not sure what sort of powers there are to prevent people from --

**Tony Arbour AM:** There are powers and I am about to ask Elliot about that but I am asking for your general view. You have just told us that you have come back from Brussels, where they are doing this all the time, eating out and so on. Is it a fact or is it simply an impression one gets that this is an important area and an increasing area where people might be suffering from pollution? We hear a lot of chat about schools. Schools do not operate for as long hours as restaurants. The children who are in schools are not out for as long as people are sitting in restaurants. I think you said an hour's exposure was very significant. To come back to my original point, is it just a mad impression I have or is it a fact that more and more people are becoming exposed to pollution because of the changing habits of Londoners?

**Professor Martin Williams (Air Quality Research, King's College London):** I do not know what the statistics are on the number of people or the increase in people sitting outside cafes and restaurants and eating, but the fact is that if you were to sit on a pavement outside a restaurant near a busy road then your exposure is going to be a lot higher than if you were inside that restaurant eating because you are much closer to the emissions, for a start, and in buildings pollution levels get attenuated by absorption on surfaces and all that kind of thing. There is no question that you are exposing yourself to more pollution by sitting outside near a busy road than you would be if you went inside. That is undeniable. Whether there is an increase in people doing that kind of thing is something I do not know.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I was just going to jump in and say that obviously the critical thing is improving air quality so that people can enjoy the space and enjoy the city. This is what I was talking earlier about in terms of the urban realm. Obviously also as part of the Mayor's Transport Strategy, the Healthy Streets approach has been adopted. That tries to look holistically at the streets and the street space that we have and tries to ensure that they are safe, they are liveable, there is good shelter and the air quality is good. This is part of a strategic approach to make sure that we can encourage people to walk and cycle and be outside, and for that not to have health consequences. As I explained, we are starting to have impacts. Around Putney High Street was one example. In other locations we expect that things like the ULEZ will deliver further improvements when that is introduced later this year [2019].

**Tony Arbour AM:** Let me come back to the point. You were talking about having the signs at stations and schools getting emails about high pollution levels. Had it ever struck you that this fashion for eating outside and as close to the highway as people could possibly get is something that ought to be talked about?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** We think a lot about streets and about exposure on the streets, and we know that it is not just the case that people walk up and down the street. Yes, we are definitely aware that some people sit outside, whether that is to sit on a bench or to sit at a cafe.

**Tony Arbour AM:** I revert to my initial point. These are people who are probably quite intelligent and who would have been exposed - to coin a phrase - to [the Mayor's] messages about this, but on the face of it it does not seem to have an effect. Can I extend that to what you are doing in relation to schools which are on highways? This is something over which the GLA has control. The Mayor has given grants to schools for green walls and green barriers and things of that kind. First, can you tell me how successful that has been?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** The School [Air Quality] Audit programme covers a whole range of potential interventions. Some of them are, as you say, green screens and other green interventions. You have to think about how you are using those screens. Vegetation itself can have a small benefit, a small impact; however, normally the greater benefit that you get from green infrastructure is the barrier effect, and then of course because it is a green screen or a green barrier it has a whole range of co-benefits and it is an attractive addition to the school environment. There has been a study done in a London school to try to understand the benefits. That showed that there was a reduction in terms of pollution behind the barrier, but we are going to be doing some more work around this because we understand --

**Tony Arbour AM:** How many applications there have been? How successful has the Mayor's campaign for this been? How many schools have applied?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I would have to get back to you with the --

**Tony Arbour AM:** Do you think it was a lot?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Yes. Again, please do not quote me on this number because I do need to check it but I think it is around the 50 mark.

**Tony Arbour AM:** Can I give you an example of a school in my constituency? This is a school called St Stephen's Church of England Primary School, which is on the A316 Chertsey Road on a roundabout near the Rugby Football Union. They have had a grant from the Mayor, but TfL are refusing to allow them to plant their green wall because it is on TfL land. This is something that clearly is in the GLA's gift. The Mayor, after all, is Chair of TfL. On the one hand, here is the Mayor giving out the money, and on the other hand, here is the Mayor as Chair of TfL saying, "No, you cannot do it". Is this the kind of problem you have been aware of?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** When you install things like green infrastructure and you are using people's land - obviously this is not just a small estate, this involves TfL as well - we also have to work with partners. What the school audit approach has enabled us to do is to bring those partners around the table, and as I understand it with that specific case there is still work ongoing and discussions ongoing. I will happily provide you an update separately on that once I have had a chance to get into the detail.

**Tony Arbour AM:** This is why I am having a go at Elliot, not at you, Professor. Elliot, so to speak, is the servant of the GLA and this is one of the very few areas where the GLA can actually do something. I have just drawn your attention to this school and you can do something. Similarly, this is not something I would advocate for one moment but in relation to eating on the pavements and making use of land outside shops and along the public highway, this again is something where you have real power and you could really do something. I have seen no proposals. You might think, Chair, that when we write our report we can draw attention to the fact that this is something we can actually do rather than speaking in euphemisms.

**Caroline Russell AM (Chair):** Can I just ask what exactly you are suggesting? Are you suggesting green walls on all TfL roads or are you suggesting more measures to reduce traffic and protect people?

**Tony Arbour AM:** No, not at all. So far as the green walls are concerned it is no use one arm of the GLA doing something and being prevented by another arm of the GLA. In relation to the eating out, if it really is a bad thing, personally I think it adds to the gaiety of life and if people are well informed about particulates - I nearly flippantly said "and want to shorten their lives by having a cappuccino and a whole load of NOx" - then that is their choice. It is something that we can control through planning legislation. That is really the point I am making.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** As I say, I am not an expert in the area of the planning rules and how they can apply. I imagine that there are probably issues in terms of trying to take action retrospectively. Rather than focus on trying to stop things like that from happening, I would go back to the fact that the Mayor has set out a strategic approach which is going to improve air quality and, through the Healthy Streets approach, let people enjoy and use our streets. Surely that is the outcome we all want. We want people to make the most of all the opportunities that London provides.

**Tony Arbour AM:** I do support that.

**Shaun Bailey AM:** We have spoken a lot about what is being done about transport and what particulates the cars put out. Indeed, the Government have gone so far as to ban diesel cars by 2040, a big step. Why are we not talking, particularly from an education point of view and a legislative point of view, about what goes on in people's homes? Our very own Jennette Arnold [OBE AM] pointed out to me that our greatest exposure is in our kitchen with gas stoves or whatever. Why are we not doing something about that? We talk about an education piece. If I start to change my behaviour in the home --

**Caroline Russell AM (Chair):** Shaun, this is coming up in your section when we are looking at non-transport. We will stick to the briefing. Can I bring in Jennette please to look at road transport in particular?

**Jennette Arnold OBE AM:** Can I just say thank you for Mr Bailey for formally making me a mayoral want-to-be advisor? I have been waiting for this all my life.

Before I ask my question, can I just raise a point? Going back to what Tony [Arbour AM] was saying, as the representative of the sidewalk cafe borough of Islington I would ask that before we put anything in our report we speak to local authority planners. Tony, I do not know what they do in your part of the world but you will find that - I think this is the correct term - the curtilage outside of the shop is part of either the lease or that business frontage. I know that boroughs, certainly Islington, do all that they can to work with businesses because as well as the possibility of their customers breathing in a higher level of polluted air, there are also the restrictions that are placed on people who are walking, using Shank's pony and stuff like that. It is a contested area at the moment. I do think we should ask some questions before we add that in and take on the business community, which it seems to me have every right to go about their business. That is why they are looking to the Mayor of London to use all of his powers to improve the air quality.

That is why it is great for me to be able to skim these questions on road transport. I would like to ask you, Elliot, to just briefly tell us how the Mayor is maximising the air quality benefits that he already knows about from the Toxicity Charge (T-Charge) and the expectations with the forthcoming ULEZ in April 2019.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Obviously, as I said, we have set out an overarching approach in terms of trying to tackle emissions from road transport. The T-Charge was a precursor or stepping stone towards the ULEZ. The T-Charge set a Euro IV standard for all vehicles in central London and operated just as congestion charging now. Basically, it was in effect a surcharge to the Congestion Charge. The ULEZ is very different. That is obviously coming in in April [2019]. The way it is different is that it is a 24-hour charge, seven days a week, 365 days a year. It is obviously in the central London area to start but over time will expand up to the North-South Circular roads.

We think it is going to be a very effective intervention. It is going to set tighter standards. Although petrol cars and petrol vehicles will stay at the Euro IV standard, diesel vehicles will have to meet the Euro VI standard and that is expected to reduce NOx emissions from road transport in central London in 2020 by about 45%. You can see the scale of that as an intervention and the benefits that will deliver in terms of improving air quality and reducing some of those health impacts that we were talking about.

**Jennette Arnold OBE AM:** There are some areas where you have given a longer transition period. Can you put that on record? That is for their vehicles to move from the Euro IV standard to Euro VI.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** In the central London area there is going to be a sunset period for residents to give them until 2021 to meet those standards, recognising that in the central area, if they live there, they are going to be more likely to have to use their vehicle. There are some sunset periods in place. Later on when we introduce the expanded area there will also be sunset periods for charities and those who have a disabled tax class vehicle.

**Jennette Arnold OBE AM:** That is fine. Then - again, to get it on record - within the ULEZ, would it be only the one charge of £24 for the day?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** The ULEZ charge is depending on the type of vehicle. For a car, a van or a motorbike, the daily charge is £12.50. For a heavy vehicle, a bus, a coach or a lorry, the daily charge is £100. The ULEZ is separate from the Congestion Charge. The Congestion Charge applies from 7.00am to 6.00pm. If you were to drive into the central area in congestion charging hours and you did not have some kind of exemption or discount you would have to pay the Congestion Charge, and if you did not meet the relevant ULEZ standard you would also have to pay the ULEZ charge. However, they are separate charges and it is appropriate to think of them separately given they are trying to do different things and that one applies at different hours.

**Jennette Arnold OBE AM:** But overall it is an additional £8,000 or so that individuals will have to find if they are in the Congestion Charge zone and their vehicle does not qualify.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If they had already been driving with the Congestion Charge before the ULEZ had come in, half of that amount would not be additional. It would have been the ongoing cost that they would have been subject to, at different levels, since 2003 when the Congestion Charge came in. Again, as I say, it is appropriate to think of them as separate.

**Jennette Arnold OBE AM:** There is a figure for both, is there not? There is an annual figure --

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If you ended up being liable to the --

**Jennette Arnold OBE AM:** -- and we should say so that people can accept that. People will have to find about £6,000 or £7,000 a year extra.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** My point is that it would not be extra if they were already paying the Congestion Charge because the Congestion Charge has been in place since 2003. It would be half that.

**Jennette Arnold OBE AM:** Take away the word “extra”. This is the cost.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I understand what you are trying to say.

**Jennette Arnold OBE AM:** This is an additional charge Londoners will have to pay - or anybody else visiting - of around £6,000 to £7,000. People talk about behaviour change. Do not ever dismiss that because that is a great driver for behavioural change and I think we should wait to see how that impacts on people before we set about anything else. That is just my personal view.

In terms of the impact of the ULEZ on PM2.5 levels, over what period of time, just share with us briefly, what sort of graph you expect to see.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** By 2020 in the central zone we expect around a 60% reduction in PM2.5 exhaust emissions. We just had a very important conversation around tyre and brake wear. As we know, as the engines are becoming more efficient over a number of years thanks to Euro standards, as I explained, there have not been the same issues for PM with Euro standards. The exhaust component is now probably smaller than the tyre and brake wear component, which is why it is so important, as well as doing things like the ULEZ to continue minimising exhaust emissions, to also tackle other sources including tyre and brake wear. It is a significant reduction if you think about 60%.

**Jennette Arnold OBE AM:** The press I have been reading is suggesting that over a million have been on the TfL site to find out about the impact of the ULEZ on them. Could you share with us generally if that is correct?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Yes. Obviously there has been an extensive outreach campaign being led by TfL. The Mayor, when he first entered office, was talking about bringing forward the start of the ULEZ and then expanding it. There have been very large consultations which have had a lot of interest and a lot of coverage in the media. This has been talked about since 2016.

Then since the summer of last year [2018] there has been an extensive campaign, led by TfL, which has resulted in 2.5 million emails being sent and over 250,000 letters sent recently to owners of non-compliant vehicles in the zone and an outreach programme particularly targeted to businesses which has talked to thousands of business about the ULEZ and how that might impact them. Obviously as we enter the last three months there is a real ramping-up of that effort and you will start seeing the boundary signs going onto the zone. Variable emission signs are also being used to make sure that people are aware of the boundary and when the scheme is coming in. There has been a lot of direct work with stakeholders and using stakeholder networks. As you were saying, there have also been 1.5 million people who have used the online checker which TfL has put in place so that people can check whether their vehicle is compliant or not. All of this is underpinned by a major marketing campaign being led by TfL and by the same team who delivered the original Congestion Charge.

**Jennette Arnold OBE AM:** Is there any independent monitoring? TfL sending 2.5 million emails does not mean to say that 2.5 million Londoners are reading those emails or opening their notorious brown envelopes. Is there some independent monitoring in place? There is a bit of scepticism about TfL data.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** TfL are leading those efforts and so TfL are managing that work. Obviously, it is a fair point, particularly around emails. I am not a marketing expert so apologies if any of this is not quite right but my understanding is that TfL do have an understanding of the follow-through, someone actually opening the email and then assuming that it was then read. One of the ways of tracking and understanding what is actually happening in terms of the behaviour is the fact that, following on from those emails, there have been those 1.5 million people who have taken action to check their vehicle on the TfL website. That gives you a sense that people are definitely taking action to make sure they are aware of the ULEZ and what it means for them.

**Jennette Arnold OBE AM:** Professor, just a few questions to you. Can I just start by thanking you for your work at King's [College London]? As someone who suffers from obstructive airways disease, we sometimes forget the hundreds of thousands of Londoners whose quality of life is affected by air pollution. They seem sometimes to be an afterthought.

You have seen the information about the ULEZ. Is the focus right? Should we been trying to get a higher level of understanding about the health impacts in terms of the quality of our lives? Does that not resonate with people more, mums and grannies, when they hear that their dearest's lungs are going to be affected? Should we not be bolder about this?

**Professor Martin Williams (Air Quality Research, King's College London):** We have talked already about media messages and getting the message across to the public at large. Yes, the introduction of the ULEZ is another good opportunity to do that. I mentioned before that you can latch onto new research that comes out to make the message get across. The introduction of the ULEZ is another opportunity like that to spread the word and to make people more aware. It has to be a very good thing.

One thing I should say in terms of effectiveness is that colleagues at King's and at Queen Mary [University of London] are embarking on a project to look at the impact of the ULEZ on children's health funded by the NIHR, the National Institute for Health Research. There is some work going on to look at the impacts as well but for getting the message across, as you say, I think that is an ideal opportunity.

**Jennette Arnold OBE AM:** That is good news. We will watch that with interest.

**Tony Arbour AM:** I would like to ask about the efficacy of the T-Charge. We were told by TfL that the T-Charge would only make a negligible impact on NO<sub>2</sub> emissions. What impact has there actually been? What emissions have been saved?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** There are a couple of key points to make. As I was explaining, it was an important intervention in terms of preparing the ground for the ULEZ and as a stepping stone to ULEZ, which is going to have those very considerable impacts that I was talking about. However, in terms of the T-Charge specifically, we have seen now that 95% of the vehicles seen inside the central London area during charging hours meet that Euro IV standard. That was a 30% reduction in the number of non-compliant vehicles since, I think, February 2017. It means that on an average day, about 1,000 non-compliant vehicles that would otherwise have been there are no longer there. Obviously, that does have an impact and a benefit in terms of air quality.

Now, in terms of trying to understand what that specifically means in terms of air quality in the central London area, we are in the process, as I say, of updating these figures but I think the last figures we shared with the [London] Assembly were of an 8% reduction in concentrations. I am not attributing all of that to T-Charge - there is a whole range of factors that are currently at play, including the improvements to the bus fleet - but I would have expected T-Charge to have contributed somewhat to that.

**Tony Arbour AM:** You think it is value for money?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** It was an important intervention in terms of setting the stage for the ULEZ which, as we have heard about, is important in terms of ensuring there is good awareness and that people are preparing for it. Yes, I think the T-Charge was an important intervention.

**Tom Copley AM:** Just on the ULEZ, as someone who lives just south of the South Circular I would appeal for it to cover the whole of Greater London, not just inner London. I represent a ward on Lewisham Council which is outside of the ULEZ as well and apparently the air quality on Sydenham Road is worse than it is on the South Circular. I would love it if the ULEZ went even further.

My first question is something we touched on earlier, which is about reducing brake and tyre wear emissions. There are things like regenerative braking. What sorts of technical innovations are there and what is the Mayor doing about this issue of tyre and brake wear?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** As I was explaining a bit earlier and as I think Professor Williams was explaining, regenerative braking provides a potential mechanism for new vehicles, with potentially obviously the switch to electric vehicles, to tackle not just the exhaust component - which, as I said, some of the Euro standards have been quite effective at tackling - but also ensuring that you tackle the tyre and brake wear itself. I think that regenerative braking technology is going to be important, as was being discussed. In order to get that right we need to work with the manufacturers to explain what the needs and the concerns actually are. We are trying to take forward some of that work through the international fora of which we are part but I think Assembly Member Bailey was exactly right that we also need to be talking to Government, and we do talk to Government about this. I know that Government have been thinking about what more can be done in order to make sure that they are bringing their voice to the table as well.

In terms of other interventions for tackling tyre and brake wear, Assembly Member Cooper was spot on the money earlier when she was saying that the hierarchy that we have set out in the Mayor's Transport Strategy is probably the most powerful intervention we have, which is getting people to walk, cycle and use public transport. The amount of investment and commitment that is required in terms of delivering that is massive from the Mayor and is, of course, probably the main intervention that the Mayor is taking to tackle tyre and brake wear.

**Professor Martin Williams (Air Quality Research, King's College London):** I will just add a little bit to that. Firstly, again, I would just repeat the uncertainty in the science. Assembly Member Cooper mentioned earlier that there is a trade-off between potentially increasing weight of vehicles which could lead to an increase in these emissions and regenerative braking which would work the other way. We do not know which way things are going to go in the future right now.

The other thing to say is that in terms of technologies, manufacturers are already looking at this issue. There is no policy on it anywhere or no legislation around the place at all, but manufacturers nonetheless see the way

the wind is blowing and are looking at techniques to minimise or enclose brakes to try to minimise the emissions.

The other thing that is being looked at, in my understanding, is the composition of the brake system because the concern over the toxic effects of these emissions results mainly from the metals that are in the particles that come out. Obviously, if you have two metal surfaces rubbing against each other, you are going to generate small particles of metals and they are the toxicologically active species. Manufacturers are looking at alternative materials, ceramics and the like, to try to understand whether one can reduce the toxicity of the emissions even if you do not necessarily reduce their mass.

**Tom Copley AM:** Yes, absolutely I agree that the best thing is to get people out of cars altogether.

**Professor Martin Williams (Air Quality Research, King's College London):** Quite.

**Tom Copley AM:** Moving on to the secondary engines point, what is the Mayor doing to tackle emissions from secondary engines? Am I right in thinking there are regulations on secondary engines, but they are less stringent?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I might bring my colleague in, Stephen [Inch], who does a lot of the work we do on mobile machinery including these kinds of engines.

**Caroline Russell AM (Chair):** Can we just clarify first; these secondary engines are the refrigeration engines on the big lorries?

**Tom Copley AM:** Yes, secondary engines, yes.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** Yes. Secondary engines are used for a number of purposes on different vehicles - for instance, cement trucks would have a secondary engine that turns the big drum on the back - but transport refrigeration units are obviously a significant portion of the fleet. As Elliot said, they count as what is called 'non-road mobile machinery (NRMM)', which sounds a slightly odd definition for something that is on the road. Essentially if it is not striving the power of moving the vehicle forward it falls into that regulatory category, which is a slightly odd name.

As with road engines, there have been progressive European standards evolving over the last 19 years or so. Stage V, which is the most recent standard, came in in January this year [2019]. They are, in some ways, much more complex than the Euro standards for roads just because they look at different power bands and slightly different types of engines. It is a bit messier, but the principle is the same. They have been driven forward over time.

One thing that has changed significantly with Stage V, which is a real big step forward, is that previously they were restricted to between 8 or 9 kilowatts and 560 kilowatts and did not consider engines that were smaller or larger. Obviously, a lot of these little refrigeration engines would be smaller than the regulated category. Stage V has closed those gaps. From this year, any new transport refrigeration engines are regulated.

In terms of where they sit relative to road engines, the regulations are not quite as tight as on a big heavy goods vehicle, although in the middle ground where you have got construction machinery and things that they are starting to align between road and non-road engines. I could send you figures and graphs if you are very interested, but the key point is that while they are regulated, what we do not have is the controls that we have



through the ULEZ to say you have to meet this standard. An old, unregulated transport refrigeration unit (TRU) could stay on a machine on the road until it falls apart.

**Tom Copley AM:** Right. It is not possible to regulate that through the ULEZ?

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** It is not, no. That is quite specifically about the motive engine.

**Tom Copley AM:** Sure.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Just to jump in, going back to what I was saying earlier in terms of powers, again one of the things that we set out in the London Environment Strategy and is important is making sure that the Mayor has the right powers around NRMM. There is a moment of opportunity with this new clean air legislation and it is important that we get that.

**Tom Copley AM:** Absolutely. Just finally, how much do they contribute in terms of PM2.5 emissions? What sort of proportion are we talking about?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I have got some statistics here from some work that TfL have done. It is probably around 2.5% of all road transport PM. It is a small but significant proportion. It is important to say this looks very specifically at the TRUs, not at NRMM more generally. They are individually very polluting. If we could get the right powers and we could regulate them and address them, it potentially gives you a very high return on a per-vehicle basis in terms of reducing emissions.

**Leonie Cooper AM (Deputy Chair):** Just a very brief point. The Mayor has worked with some of the other Mayors across Europe and the C40 cities group to increase appetite amongst people who make hydrogen buses and other newer technologies to say, "There are several of us who would like to buy these", to help drive down the price. I was approached by some of the people who make these vehicles who were asking about the implications of the T-Charge, the smaller ULEZ and then the expanded ULEZ and also the wider London ULEZ. These vehicles are very expensive to create with the additional facilities on them.

There is some appetite in the private sector to come forward and to create vehicles that will be at the cutting edge in terms of clean air. I would be very happy to pass on the details of the people who approached me about the details. They did not understand the direction of travel and when new things were going to be introduced. They might decide when they are investing in new kit to purchase stuff that is going to comply with what we are looking for. It is more of a carrot, I think, the fact that we are making these changes for them to step up rather than necessarily needing the stick to say, "If you do not do this, these are the powers that we can wield".

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is incredibly helpful, and I am very grateful for the offer. If you, please, connect them with me, I am happy to pick that up. I do know that TfL are considering developing a voluntary industry code of conduct. That would feed into creating a great case study so please do connect us.

**Caroline Russell AM (Chair):** I just wanted to go back to this NRMM. You were saying that it is just 2.5% of the fleet?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is just with the TRUs.

**Caroline Russell AM (Chair):** Right.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Also, what the study was able to cover in terms of understanding the number of vehicles which might partake.

**Caroline Russell AM (Chair):** My point is about exposure to very polluting vehicles. For instance, cycling this morning from Highbury down here to City Hall, I went around Highbury Corner. I was behind a construction vehicle that was moving construction stuff. They are rebuilding Highbury Corner roundabout and I was stuck behind it, breathing. It smelt terrible; I just was completely surrounded by horrible emissions from an engine. Later in the journey I found myself stuck with a bus beside me, a bus in front of me and a lorry behind me. The bus in front of me felt like a diesel bus. I was trapped in a little space, breathing stuff coming out of these engines. I just wonder, because I know that a lot of the exposures are measured as annual exposure but that exposure of Londoners to high concentrations of pollution, what is the health impact of that or should one only be worrying about the long-term, annual exposure?

**Professor Martin Williams (Air Quality Research, King's College London):** On the long-term exposure, all the epidemiological and health impact studies suggest that the biggest impact comes from that long-term exposure. That is not to say that the short-term peaks are not important; they are. We have already talked about that and they are important.

Again, it is invidious to pick on specific cases but the general consensus amongst the health community is that the health benefits of cycling, to take that as an example, outweigh the adverse effects of the higher exposures that you get when you are cycling in the stream of emissions. Clearly, there may well be outliers in that sort of range of exposures where that overall consensus does not hold and particularly on polluted routes like that you might be worse off. The exposure drawbacks might outweigh the health benefits slightly in some cases. Generally, the view is that the health benefits of cycling and walking outweigh the adverse effects. There are specific cases and it all comes back to the measures that we will take to remove the emissions in the first place is the strategy clearly. That is the kind of scientific view at the moment.

**Shaun Bailey AM:** You talked about these small diesel engines on the back of lorries for refrigeration. Is that an engineering challenge? Why are they diesel? Why are they not electrically powered? Is it just engineering or is just far cheaper to do it that way still?

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** The simple answer is yes. It is an engineering challenge. Traditionally, diesel engines are relatively easy to make. They last for an extremely long time and if you do not consider the pollution of them, there is a lot of engineering stuff you might like. That is why they have been used in these contexts.

We are aware, particularly with transport refrigeration units, there is a number of interesting innovations out there in the zero-emission space. It is possible to use the motor power engines, so the Euro VI engine, although you have to marry the two bits of the truck together in a different way.

**Shaun Bailey AM:** You have to draw the refrigeration.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** Yes. We have spoken to people who have been doing some interesting stuff with liquid nitrogen which is a waste material from a lot of industrial processes that can be used to both drive a refrigeration engine and provide direct cooling. There are a few of those on the roads and there are electric alternatives. One of the problems

is there is no real driver to encourage people to take these alternatives. They are very familiar with their diesel engines. They have been there for a long time. This is part of the point of seeking new powers to control them; it is to drive the uptake of alternatives.

**Shaun Bailey AM:** There is an alternative. It gives more, I am going to use the word, right to make that legislative change because if there is nowhere for anybody to go, they are stuck. If you could say, "You could be using a different technology", then the legislation makes much more sense.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That is also how it worked in terms of things like the ULEZ or the Low Emission Zone previously is that once you have that technology, how do you encourage people to take it up? Absolutely, but you need the technology first.

**Caroline Russell AM (Chair):** We are now going to move on and look at Tube dust which has been in the news just recently.

**David Kurten AM:** A lot of people were quite disturbed by the headlines recently. It is saying that the particulate levels in the London Underground were far higher than the legal limit of 25 micrograms per cubic metre that is going to come in 2020. Far higher. One figure I have got, 302 which is 12 times as high and that was on the Jubilee line. There is a recent report by the Committee on the Medical Effects of Air Pollutants (COMEAP) that stated that now there is no strong evidence that Tube dust is less toxic than other particulates. This is what people were saying beforehand. What are the implications of this news and the implications of the report by the Committee?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Before I start, I want to caveat my comments slightly in terms of that my air responsibility is the ambient air quality, therefore, I look after the air above ground. This is a matter for TfL. However, I can try to do my best to answer some of your questions. However, if you have more detailed questions or if it gets a bit too technical, you will have to forgive me. It might be better that, at some point, you bring in a witness from TfL to talk to you about that.

In terms of the report, there is a couple of things. TfL, first of all, would say that not only did they meet the health and safety executive specified limits, but they also meet the much tighter Institute of Occupational Medicine (IOM) limits in terms of exposure to respirable dust. Of course, the report itself had a whole series of recommendations. Basically, one of the key findings was is that more research was needed to understand what these impacts were. There were recommendations in the report around TfL having to do additional monitoring and trying to then make that available to a whole team of researchers and anyone who might want that from the academic community, therefore, they can try to get that stronger understanding of what the implications might be.

It is important to bear in mind that TfL has been very proactive on this. They are the people who went to the COMEAP to ask them, "Can we have updated advice based on the previous work that has been done with the IOM?". They have also been extremely proactive in the sense of trying to identify various different interventions which might be positive and helpful, particularly around their cleaning regime which they are doing a lot of work with in terms of enhanced cleaning and trying to understand the impact that has in terms of things like PM levels underground.

Work is underway to try to reduce those levels. That is obviously a very clear recommendation from the COMEAP report. TfL have accepted that recommendation. They are taking that forward and they are also supporting the academic and wider air quality community in terms of getting that better understanding of what the impacts potentially are.

**David Kurten AM:** You mentioned there were some limits and TfL are saying that they meet limits which are set by the IOM and other bodies. What are those limits, and do they relate to PM2.5 and do they relate to some other category of particulates?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** This is where you might be entering a space which is beyond my level of expertise. I would hate to say something that was wrong because, as you can appreciate, this is quite a sensitive subject.

**David Kurten AM:** Yes, right.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I am happy to go away and try to talk to TfL and then get some information which we can send in writing to you, if that would be helpful.

**David Kurten AM:** It would be good to know. I appreciate that you deal with aboveground but if you have a level of 302, and they are saying that meets limits but then the limit coming in is 25, then we need to understand where the discrepancy is.

**Professor Martin Williams (Air Quality Research, King's College London):** I am not an expert on occupational limits and so forth, but I have a feeling, from memory, that the metric is what is called total suspended particulate which is the size ranging bigger than PM10. We are not comparing like for like in that sense and equally in terms of the limits, you are not comparing like with like there either because the ambient limit values in the EU are designed to protect the whole population including the more sensitive groups, the elderly and children. Occupational limits, of course, generally are set much higher than that on the basis that firstly, the working population is healthier than the population at large.

**Caroline Russell AM (Chair):** Are you suggesting that it is OK or that TfL are arguing it is OK because the working population is healthy and not vulnerable and, therefore, they do not need --

**Professor Martin Williams (Air Quality Research, King's College London):** No, I am not blaming you. I am not making any objections here at all. I am explaining the way the system works. The way the occupational system works is that it is a dialogue. The way the ambient system works is that a limit value will be proposed which is designed to protect the more vulnerable people as well as everybody else; the children, the infirmed, the elderly. That is then put out for public consultation and everybody gets a say and the democratic process takes over and you end up with a value that is notionally acceptable to the population at large.

The way occupational exposure limits work is that they are done in one step with consultation between the industry side, the unions and the workforce. The idea there is generally the philosophy is that firstly, you have a healthier population and secondly, you have people being paid to be exposed to these things. That process tends, across the board, on average, to lead to laxer limits than the ambient ones. Those are essentially the reasons. That is why the limits are different.

**David Kurten AM:** I just want to think about this. The figure I have got here for the IOM, the guideline is 1,000. You are saying that is for total suspended particulates which is different.

**Professor Martin Williams (Air Quality Research, King's College London):** Possibly, do not quote me.

**David Kurten AM:** OK, we need to check that. If that relates to a different thing than the coming legal limit which is PM2.5, the two things would be two separate issues. This is a very important point to take onboard.

**Professor Martin Williams (Air Quality Research, King's College London):** The only other thing I would say is that the particles, from reading the COMEAP report and the literature that they looked at, the makeup of the particles is completely different in the Underground from the ambient. It is virtually all metals or metal oxides. You get very little of that stuff in the ambient atmosphere. In the Underground, you do not get any of the diesel exhausts and the combustion emissions that we know are toxic. I label diesel exhaust as a huge carcinogen and so on. You do not get that in the [London] Underground. There are good reasons for needing to do more detailed toxicological work on the particles that you get from the Underground. We just do not know how toxic they are or how benign they are. That is the crucial area here.

**David Kurten AM:** It seems to be that the report is suggesting that there is no evidence that that is less toxic, and we need to take it seriously.

**Professor Martin Williams (Air Quality Research, King's College London):** No. There are good reasons to believe that metals could have toxicological effects. You can see the earlier discussion on the exhaust emissions from the type of brake wear.

**David Kurten AM:** This can cause Alzheimer's disease and so on.

**Professor Martin Williams (Air Quality Research, King's College London):** Yes, absolutely.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** It is worth emphasising again that obviously TfL has accepted the recommendations of the report which is to do more work to try to better understand what those are. That is important. As I said, I am more than happy, given that this is not my area of expertise, I am a bit worried that there is probably someone at TfL right now shouting, "You should just say this, say that" when I am trying to get a key bit of information across. What I will undertake to do is to talk to TfL and if you are happy for me to do so, write with a proper update on this.

**David Kurten AM:** Two figures that would be quite useful to have as well as the total suspended particulates underground, it would be also useful to have the PM2.5 level. It would also be useful to know what the legal limits are going to be for total suspended particulates, if any, therefore, we can compare the different figures.

You have mentioned some things that TfL might be doing in order to try to reduce those levels on the network. Can you say a bit more about that, particularly in terms of tunnel cleaning? That is something that might be very positive as an action. Can you say any more about how they are going to do that and how that is going to be rolled out?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** At the moment, the work TfL is doing in relation to tunnel cleaning and also to platform cleaning is very much as a trial to try to understand what the most effective technique is, what the most effective timing is, the sequencing, how often you have to do it and also what the most effective area that you need to do is. Can you just do the platform? Do you need to go into the tunnels? Can you use things like sealants or other kinds of mechanical agents to try to prevent resuspension? They are doing that work now. They are getting a range of results and I understand that when that work is complete, they will be making a decision about going forward; what the most effective way is. What this underlines is TfL is committed to trying to bring down any levels of particles of anything else in the air underground, the lowest possible level, to make sure that staff and customers breathe the cleanest air possible. That work is underway.

**David Kurten AM:** I do not know if you can answer this. How often do they do tunnel cleaning? Is it every day or is it every week or every month? How regularly does that happen?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I cannot answer that categorically, but I think that the work that I was talking about in terms of the measurements that they are taking and in terms of the cleaning trial, in terms of the roller enhanced cleaning is to understand exactly those kinds of issues. Do not forget that we are often talking about doing, for example, the track bed and the tunnel in-between stations. They are trying to understand how often they should do that and what the most effective combination, or the way of doing that will be to bring down particle levels on the Underground.

**David Kurten AM:** Yes. Are there any other ways apart from tunnel cleaning that would reduce the concentrations of particulates?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I know that there has been work which has been done in terms of other metros in terms of trialling all kinds of different ideas. Everything including electrostatic precipitation and other techniques and that is using the current to basically, for want of a better phrase, stick down particles.

I do not know the details of this. Again, I can provide a bit more of an update when we write, but I do understand that TfL did look at the feasibility of a whole range of interventions. The one that they are definitely starting with and focusing on because they think it is likely to be most effective is that enhanced cleaning regime.

**David Kurten AM:** How about any technologies to do with the trains and the rails? Professor, you have said a lot of the makeup of the particulates in the Underground is due to metals. I assume that comes from grinding between the wheels of the trains and the tracks. Is there anything we can do about reducing the rate at which those particulates are generated?

**Professor Martin Williams (Air Quality Research, King's College London):** I could not answer that.

**David Kurten AM:** No, OK. That is something for TfL, yes.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** That has reminded me in terms of time and again, I will give you chapter and verse when we write on this subject. I do understand that, for example, the new Victoria line trains do use regenerative braking and they have seen an impact in terms of that. Much of what we see in terms of time brake wear, as Professor Williams was explaining, on the Underground you have the large component of metals and of course that is going to be because of the friction between wheels on the track. That is something that TfL have used as a mechanism for reducing those levels and they have seen some positive results. Of course, this is part of the wider upgrade and investment in the Underground. Apologies, I am not giving you a fuller and more precise answer now but we will come back in writing to give that to you.

**Leonie Cooper AM (Deputy Chair):** I wanted to ask you about how we are going to inform the passengers but just before I get into that, I just wanted to ask you about this issue of the particle size. At the moment, we are saying that TfL does not, or you do not, know that there is a breakdown between the total suspended particulate matter in the Underground as measured and the smaller particles, the ones that we know cause the issues, particularly the PM2.5s. Is that something that is going to be looked into and we are going to be given

those details of the breakdown of 2.5s and smaller nanoparticles as a percentage of the overall level of dust in the Tube?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Again, that is probably one to handle by a letter but, as I understand it, TfL have already published a large amount of this information from the regular sampling and testing that they do on their website. Obviously, I know that King's [College London] has recently done some work which is published alongside or is definitely covered in terms of the COMEAP work which did look into in much more detail. I am not sure if Professor Williams wants to add anything more than that.

**Professor Martin Williams (Air Quality Research, King's College London):** I do not have the details to hand. That is something we need to come back on in writing.

**Leonie Cooper AM (Deputy Chair):** The headlines that have come out from the COMEAP data, the 302 micrograms per metre cubed on the Jubilee line, do we think that is PM --

**Caroline Russell AM (Chair):** That is PM2.5.

**Leonie Cooper AM (Deputy Chair):** That is PM2.5?

**Caroline Russell AM (Chair):** Yes, it is PM2.5.

**Leonie Cooper AM (Deputy Chair):** Generally speaking, what we found is we have had more evidence come forward in terms of the smaller particles which are able to cross through the lung into blood and then get around the rest of the body. One of the makeups of those tiny particles is, in the main, iron which, as it seems to be what we are saying, is most of the particulate matter in the Underground is iron fragments, really tiny fragments. Surely those fragments, whatever they are made up of because they are so tiny and because they are, therefore, able to circulate around so much of our bodies are going to have a not very good impact on us physically as particles made up of anything else; just because they are so tiny, and they can jump so far.

**Professor Martin Williams (Air Quality Research, King's College London):** They probably could but the precise impact is still something that is not clear.

**Leonie Cooper AM (Deputy Chair):** That has not been sufficiently researched, is what you are saying.

**Professor Martin Williams (Air Quality Research, King's College London):** Not yet, no.

**Leonie Cooper AM (Deputy Chair):** At this stage, we are not at the point where, for example, if we are doing regular measurement in the Tube, and I understand that TfL is moving towards doing some sort of more constant monitoring, that if it is a bad air day underground, we are not going to start sticking up signage for passengers to say, in the way that we are warning people now of a bad air day above the ground because we know of the health connection, we are not, at this point, going to start warning people that it is a bad air day down in the Tube or anything like that.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** My understanding is that there are no plans for that although, as I say, I think you and Professor Williams have just alluded to one of the key findings from the report, which is that more research is needed to understand what those impacts might be. TfL has been very proactive. They have accepted the recommendations from COMEAP. They are going to work to improve their sampling and do more enhanced monitoring and make that available to researchers. As we have

heard, they are also taking action or exploring what is the most effective action in terms of reducing particle levels underground.

**Leonie Cooper AM (Deputy Chair):** In terms of the staff, I take your point, Professor Williams. However, I do not completely take it. If you travel on the Tube in the morning, for example, or if you travel slightly earlier than most people in the evening rush hour -- only yesterday I met 50 children in my carriage who were travelling back to Furzedown ward, where I live in Wandsworth. They were travelling to Penwortham Primary School. Now, they had all been out on a day trip, so they do not do that trip regularly. However, there are many children who travel on the Tube to get to school. Therefore, while the levels might have been set for healthy adult workers in a workforce, lots of people use the Tube who might be -- and we are making the Tube very accessible. Part of our strategy is to make public transport accessible. Again, coming back to the 80% of the Mayoral Transport Strategy then surely, we need to be bringing the air quality in the Tube up to the levels for the people who might be most harmed.

**Professor Martin Williams (Air Quality Research, King's College London):** Yes. That is an issue for debate obviously and my point was that those lax occupational exposure limits would not apply to the school kids, they would apply only to the staff that work for TfL, clearly. The question is then still open as to what one ought to do to protect the non-workforce people who are using the Underground.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Just to jump in, I am sure that TfL would say that they are absolutely committed to making sure that all their staff and all their customers breathe the cleanest air possible when they are on the Tube. They would not say, "This is just something we are doing for our staff". They see it holistically as anyone who uses or operates or works on the Tube, including children.

**Leonie Cooper AM (Deputy Chair):** Looking specifically at the staff, we have done some calculations about how much exposure somebody would get who travels on the Tube for 46, 47 or 48 weeks of the year for 20 minutes in the morning - or half an hour, you know, whatever it is - and it is not great. For a member of staff who might be working a six or eight-hour shift and is down there for a considerable period of time, do you know, Elliot, whether there has been any investigation into health impacts on, for example, the lung health of Tube drivers? I would think they must be the ones most affected.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Again, I can probably write to you with more detail about that. However, as I understand it - and as I say, occupational health is not my area of expertise either - TfL have not seen any trends. Obviously, they have had people working underground for many years and they do a lot of work, not just for air pollution but for a variety of reasons, to understand health when operating and working in an underground environment. Therefore, I will happily talk to TfL and see if we can get you something more in writing in terms of that. I do not think there is any history of a greater susceptibility for things but I will write to confirm.

**Leonie Cooper AM (Deputy Chair):** That would be great. It is slightly frustrating because two years ago we actually talked about Tube noise and the person from TfL who deals with Tube dust and particles actually came to that meeting in error. She had almost nothing to say because we were talking about decibels and noise and the impact on people above ground as well as in the carriages, which I must say is--

**Caroline Russell AM (Chair):** We asked the wrong questions.

**Leonie Cooper AM (Deputy Chair):** -- which is not improving any as far as I can tell. The Victorian line yesterday was dreadful and so was the Northern line.



**Caroline Russell AM (Chair):** I think what we take from that is that there are very high levels of PM2.5 underground. We definitely need to know a lot more about the impacts on both passengers and workers and we will be following up. If you can, Elliot, come back to us with some information from TfL, but we may also well be following up with some very specific questions.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If you will allow me, Chair, I will probably talk to Ian [Williamson, Scrutiny Manager] offline about what might be more appropriate. I am happy to be the conduit although it might be more effective if you write to TfL given that this is their area of expertise rather than mine.

**Caroline Russell AM (Deputy Chair):** I would think probably the Committee should be writing to TfL with some questions about it.

**Shaun Bailey AM:** In view of the level of investigation needed into this subject and some of the big questions about how the occupational level is calculated, should the public and staff have a different level because of the amount of exposure?

I think we should actually speak directly to TfL in a session. There is a lot here to be investigated because there are some Londoners, if they pursue the Mayor's wishes of giving up their car, who will have to spend many more hours on the Tube. Because I personally live far away and ride the Tube for a very long time, well over 20 minutes actually, in both directions and well over 40 minutes sometimes, I would like to know what I am breathing in.

**Caroline Russell AM (Chair):** Absolutely. I think most Londoners would like to as well and we will definitely be following up on this. Shaun, I am going to bring you in now to raise some questions about non-transport particulates.

**Shaun Bailey AM:** Let me start by asking this first question primarily to Elliot. How well are non-transport sources of emissions measured and understood within London?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I will probably share the section quite a bit with my colleague, Stephen, who kind of does a lot of the work that we do in terms of non-transport emissions. Stephen will probably jump in with a bit more but obviously, as a starting point, the main tool that we actually use in terms of understanding emission contributions from various different sources is the London Atmospheric Emissions Inventory (LAEI). That captures a relatively good understanding of most of the main sources. However, we would be the first to accept that we keep that inventory under review. We continually try to improve the inventory and we will have a version of that inventory coming out this year which will deliver some further improvements.

One example - it is transport but we would think of it in many ways as a non-transport source - is around river emissions. We have done a lot of work with the Port of London Authority (PLA) to improve our understanding of those emissions.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** On the river, there has been a really successful collaboration between the PLA and the TfL team who developed the LAEI. Specifically, the PLA's updated port inventory is in a format that can be directly incorporated into the next round of the LAEI, which is based on real shipping movements. Some additional work was done with portable emissions monitoring systems. Essentially, they put emissions monitors on boats, stuck a probe into the --

**Shaun Bailey AM:** In a sense, is measuring emissions on the river not the same as measuring emissions on the road? The difficulty, I imagine - and please correct me if I am wrong - is measuring general emissions from the home, from gas, central heating, whatever. It strikes me as slightly more complicated if only because the area is so much larger and there are so many different ages and types whereas measuring it on a vehicle, whether that vehicle be floating or driving is roughly the same.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** Yes to both parts of your question, I think is the short answer. However, in terms of the river one of the key distinctions between that and the road is the extent to which we understand the fleet. We previously knew a lot less about the kinds of engines and what they were putting out on the river, compared to what we know about what is going on the road. You asked about building emissions and other sources.

**Shaun Bailey AM:** Yes. Heating, cooking, wood-burning stoves, those kinds of things.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** That is something that there has been quite a bit of work on, as I understand it, with the development of the LAEI to see how far we can update our understanding. For instance, boilers and cookers will all get wrapped up in a figure that is derived from gas use throughout London. However, one piece of research we have done that has just recently been published was looking at whether boilers degrade over time. If you know what a boiler was putting out when it was built, does it stay the same or does it get worse. It was a very small study; a sort of pilot piece of work and the initial indication is that they look fairly stable which helps improve some of our inventory work there.

We have been doing quite a lot of research into the prevalence and use of combined heat and power (CHP) across London, which feeds into some of that as well and we talked earlier about some aspects of NRMM. As you know, we have the NRMM Low Emission Zone for construction sites that we do through planning, which is backed up by a database of what is being used where on planning sites in London. We have been using that to inform the next round of the LAEI as well, making that slightly more robust in terms of understanding those emissions.

**Shaun Bailey AM:** I think where I am going, because beforehand I mentioned it, is that we have talked so much about transport. It is the most visible polluter. It was technically the one pushing out the most pollution measures and nationally, internationally and locally we are dealing with that. That now brings us to the point where non-transport emissions are at least 50% and with current legislation now have become more. Where is the Mayor's education approach affecting that? Because if you read this paperwork some of our emissions are not entirely necessary, you know, wood-burning stoves for effect when people also have central heating. It strikes me that there are some savings there that are just behavioural; far less complicated than construction or brake dust or Tube dust. Where is the Mayor trying to educate people on that level?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Yes, absolutely. There are a couple of things. The Mayor is one of the first people to talk about wood burning and about its potential impacts. Obviously, we have to get the balance right in terms of addressing that. What the Mayor definitely wants to do is to encourage people to use the right fuels. A really good example of that is the use of wet wood is much worse than the use of dry wood, kiln-dried wood. It is also about making sure that any appliance is properly maintained. Of course we also want people definitely not to use open fires, and if they are going to be burning wood to use an appliance that is Defra compliant.

Now, the Mayor also wants to go further and he has asked for those additional powers so that for people installing new appliances we can make sure they are the most efficient ones possible. In terms of the way that he has been promoting this and getting some of this information out there, he has worked with a lot of the industry bodies in terms of making sure that there is promotional material available at point of sale. Obviously, as the Chair was talking about earlier, we are considering other ways that potentially we can get important messages out there at times where you may get a lot of people doing wood burning all together which might cause air pollution issues which often happens in the winter on some days, for example. Hence, the Mayor has recognised that as an issue. He has set out some steps he wants to take and I totally agree with you, it is very important that we try to make sure that people make informed choices about when and how they burn wood in London.

**Professor Martin Williams (Air Quality Research, King's College London):** Just to add to that, I would not disagree with anything that Elliot has said. Just indulge me for a minute to fly the flag for King's College London which, by making some detailed measurements of the products of wood burning, we have managed to quantify and come to a view as to how much wood contributes to PM<sub>2.5</sub> in London, and it is not a trivial matter it is really quite important.

The other thing on informed choices and so on, the National Clean Air Strategy that Defra launched on Monday, there is a proposal in there to actually ban the more polluting fuels; ban the sale of, including wet wood, which is potentially a lot more polluting than dry wood, as Elliot said, by a lot. That has not actually come to fruition yet but the intention there is to ban the sale of things like wet wood which would actually help.

**Shaun Bailey AM:** Some of these things about the best equipment stuff, it often strikes me that that is probably best done at a national level. Let me just ask you, Professor, about exposure. Like I said, earlier on in the year Assembly Member Arnold [OBE] spoke to me about your gas fire, when it is burning you are inhaling things that as an asthma sufferer are pretty bad for you. At what level is exposure in the home because of boilers, gas cookers, central heating, is that any more potent to you as a person breathing it in than it is walking along the road; where is the exposure the highest?

**Professor Martin Williams (Air Quality Research, King's College London):** Depending on the use of gas cookers and so on it can be almost equally high indoors from gas cooking. Just by way of background the current EU limit value for NO<sub>2</sub> is numerically the same as the WHO Guideline for NO<sub>2</sub> and that guideline was set on the basis of nine studies of gas cookers in homes. It was set on the basis of indoor air quality. Now, a molecule of NO<sub>2</sub> is the same indoors as it is out on the street. Hence there should, in theory, be no difference between the impacts of it.

Particles can also be high from cooking indoors and, again, we have worked with the GLA to quantify cooking emissions of PM from restaurants and the like in London. Therefore, you have got two potential problems of cooking indoors, NO<sub>2</sub> from gas and PM particles from fats and all sorts of other materials that you use to cook; hence indoor exposures can be quite high.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If you do not mind me jumping in I think you raise a very important point. Again, I said earlier that the formal statutory responsibilities that we have are around ambient air quality being the air quality outside, however the London Environment Strategy does actually recognise and does raise the issue of indoor air quality. It does set out the importance of providing better information and one of the things that we are currently doing is we are supporting the Royal College of Physicians naturally doing basically further work to better communicate and understand and explain what those potential impacts of indoor air quality might be and then also the best ways of actually reducing

them. You gave a really good example about whether people are aware that if they use a wood burning stove what the potential impacts might be in terms of within the home.

I think the Royal College of Physicians is going to do a very authoritative piece of work and once we have that we will be in a better position to develop policy and provide advice.

**Shaun Bailey AM:** I just thought, from an education point of view, two things. On planning, why are we not asking people to provide power and heat in a different way that does not produce so much particulate material in the home? I could not care less if it is gas in my home or electric. You rent the place and it is what is in there and that you use it. Surely there is something we could do around planning.

I now want to move on and talk about construction work. There is the initial construction Low Emissions Zone. How else is the Mayor bearing down on constructions emissions? That, again, is a very significant part. For Londoners, in a roundabout way, it is also very important because if you make construction significantly more expensive that will impact us in one of our other big needs, for housing. How is the Mayor bearing down on that, bearing in mind that tension?

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** I think those are questions for me. I just want to go back to wood burning just for one very small thing. [Professor] Martin [Williams] talked about the regulations that the Government is talking about bringing forward and the Mayor did respond to that consultation. One of the key things in his response was that any new labelling of products for burning in the home should contain health warnings. We are drawing the analogy with cigarettes. That is another way of promoting that message, so that each time you pick up a bag of coal you go, "Oh".

**Shaun Bailey AM:** How else can we bear down on construction emissions bearing in mind the tension about not making construction too expensive?

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** Yes. There are a couple of things there. Obviously, you are aware, I think, of the NRMM Low Emission Zone that is done through planning. One of the other reasons we are interested in looking at other mechanisms to do that is ways of reducing the burden by making a simpler a system. However, we have, in the new [draft] London Plan, retained that concept of keeping the NRMM Low Emission Zone as part of planning going forward. This means that it has been included in the viability testing for the new London Plan. In terms of any additional cost, that was found to not be significant compared to a lot of the other things we were asking for buildings to do. It is not something that would be the straw that broke the camel's back.

We have done a couple of things to develop that Low Emission Zone further as we go forward. We revised what is called the "exemption policy" late last year, October last year [2018]. It sounds like a rather trivial thing but it is actually quite an important piece of the puzzle. It is there to allow people to use retrofit solutions for older machinery to extend their life. A retrofit solution can be a few thousand pounds whereas a new piece of machinery could be tens or even hundreds of thousands of pounds, making it key particularly for some of the smaller builders that we get that right. Also, we have been able to look at some of the data we have generated over time on that and say that for some of the things we gave automatic exemptions to previously, such as truck-mounted cranes, we have good evidence that they are available in abundance meeting the standard. Hence, we will remove the exemptions from them, which improves the overall emissions.

We have also put forward in the Mayor's Environment Strategy how we see NRMM developing over time, right out to 2040. This gives industry a good head start on understanding what they will need to do to comply in future. I have the details here if you are interested in how that is going to evolve over time. Essentially it will start to up the standards and move the zones around as we develop with a particular focus, between now and 2025, on things like the opportunity areas where we know we are promoting high levels of development, thus where we are getting the most 'bang for our buck' on that.

One final thing on construction. Obviously, the other area of construction that produces dust, although generally more in the PM10 rather than PM2.5 range, is the mechanical stuff from knocking down buildings and building buildings. We have said in the [draft] London Plan that we would look to review some of the guidance on that and we have got an eye on some of the work that King's [College London] have done about how monitoring can be used more effectively. However, we have not taken any formal steps in developing that yet.

**Caroline Russell AM (Chair):** Just before we move on to Leonie [Cooper AM] to take our next section of questioning, there is one area that has not come up, which is barbecues. In my ward in Islington there is a park where people hold barbecues and I get huge numbers of people saying that their children feel very chesty in the park on busy summer barbecue days, likewise older constituents who have lung and heart health problems who complain that they do not like sitting in the park on days when there are clouds of barbecue smoke hanging over the park. Now, the campaigners who have been trying to get the Council to change their mind about whether barbecues are allowed in the park have done lots of measurements and they have encountered really high levels of PM2.5, up towards 200. However, they do not break the annual limits in the park because obviously this is concentrated in the hot summer months.

I just wondered - this is particularly for Professor Williams but also Elliot or Stephen if they have any thoughts - about the health impact of a park effectively just having a cloud of smoke over it when it is very hot weather and lots of people, understandably, because it is a place where barbecues are allowed, want to come and cook food for an evening picnic.

**Professor Martin Williams (Air Quality Research, King's College London):** Well, yes, it is difficult. I can give you a --

**Caroline Russell AM (Chair):** It is a very specific location, I am sorry.

**Professor Martin Williams (Air Quality Research, King's College London):** There will undoubtedly be impacts on people's lung function and respiratory efficiency and so forth, and potentially on asthmatics as well. Also in summer months you are not only likely to get the barbecue impact but also ozone levels might well be high and the photochemical smog pollutants in a park. The ozone levels are probably going to be higher than they would be on busy streets and so forth, so you might well get a kind of composite effect from the barbecue emissions. The extent of the impact, of course, would be something that would depend on precisely how high the levels were and so forth. However, there would undoubtedly be health impacts.

**Caroline Russell AM (Chair):** Obviously the Fire Brigade prefer no open fires anyway. However, do you think it is advisable for local authorities to allow barbecues in the summer months?

**Professor Martin Williams (Air Quality Research, King's College London):** That is a tricky issue. I mean on the one hand they undoubtedly do cause pollution impacts, whereas on the other hand people like to do it and it is a very popular thing. I could imagine a very, how shall we say, full and frank public debate on the proposal to ban such things.

**Leonie Cooper AM (Deputy Chair):** I think you should start a petition and if the decision of people who live in Islington is to follow people in Wandsworth and agree that there should be a ban on barbecues, you just pass a bylaw that covers your open spaces. That is the way forward.

**Shaun Bailey AM:** Except that if they did not, you would have to let them keep their barbecues.

**Caroline Russell AM (Chair):** Let me move us on to Assembly Member Cooper who is going to be looking at climate change.

**Leonie Cooper AM (Deputy Chair):** Who does not have a problem with barbecues anywhere in Wandsworth at least.

Obviously in some areas the Mayor's initiatives around air quality and climate change complement each other. However, there are one or two things where they do seem to be running against each other. I just wondered if you could set out - probably you, Elliot - how we can make sure we are prioritising measures that are going to improve London's air quality while also meeting our goals around climate change, particularly as we have just agreed in the Assembly and the Mayor has also supported the concept of a climate emergency?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Absolutely. It is very important and as I set out earlier, there has been a huge emphasis on an integrated approach to make sure that we maximise the benefits both in terms of tackling air pollution and minimising any potential disbenefits and, likewise, maximise the improvements you are going to get in terms of CO<sub>2</sub> and minimise the risk of the policies interacting in a negative way. That integrated Strategy has been the cornerstone of our approach under this mayoralty. Shirley Rodrigues, the Deputy Mayor for Environment and Energy, has really championed and pushed that. She is very good at holistic thinking, thinking about how things work together, and you can really see that come across in terms of the London Environment Strategy.

To give you an example on the transport side which might be helpful, one of the things we have been very keen to do, as we have been tackling vehicle emissions, is not just to generate a very simple run-back so that as we discourage emissions from older diesel vehicles we just get people purchasing a lot of petrol vehicles, which might have a disbenefit in terms of their CO<sub>2</sub> emissions. Therefore, the way we are doing that is we have set out in the Strategy that we want a phased approach where we phase out over time the use of all fossil fuels in vehicles. That would be both diesel and petrol, and this is obviously in the context of the 80% mode shift target that we are talking on.

Consequently, for those vehicles that then remain, the goal is to switch them to zero emission technology, which will have both CO<sub>2</sub> and air quality benefits. Then of course in the context of the wider [Environment] Strategy, which is about decarbonising the energy grid as a whole, it will actually deliver significant benefits against both. That is one practical example about how, in the London Environment Strategy, we have tried to integrate our thinking and ensure we just did not have a very simple approach of "diesel bad but if you want to use petrol that is fine". It is being much more nuanced and integrated.

**Leonie Cooper AM (Deputy Chair):** However, the electricity grid at the moment is not decarbonised, therefore at the moment unless you are charging up your vehicle at home and you have solar panels all over your roof and a number of other renewables, the chances are that electric vehicles are going to be using power that is coming from sources that will contribute to climate change. Obviously there has been a push in some areas towards combined heat and power and heat networks associated with energy from waste plants. Energy from waste plants create their own set of emissions and so on and so forth. We have just been discussing

wood burning stoves. Some people obviously see wood burners as being great, although if they are then also producing PM because people are burning lots of wet wood, that then goes against that.

I am just wondering how effectively we can make sure that we are getting those priorities set. I think there are some tensions.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** Yes. I think, having worked on things like the London Plan in the past where there had not been that same integrated approach that Shirley [Rodrigues, Deputy Mayor for Environment and Energy] has insisted on and has kind of made sure happened with this London Branch Strategy and also the London Plan, those potential issues have been recognised and have been addressed head on. I might invite Stephen just to explain a little bit more about an example of how we have done that with CHP maybe.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** Yes. As I am sure you can imagine, this was an area of a great deal of discussion in the development of both the London Environment Strategy and in the London Plan, which obviously would implement the Strategy in terms of new developments of CHP. One thing I would like to draw your attention to, to begin with, is the S13 policy in the London Plan, which is energy infrastructure; very exciting stuff. That is really the policy that drives how we want to see heat networks develop in the future and there have been some minor suggested changes to that policy since the draft new London Plan was published, particularly in the language around CHP and where we see the role for CHP in the future in London.

I think it is a lot clearer but essentially the overall thrust of it is that our preference would be for low temperature heat networks which can then use renewable sources and heat pumps and all those sorts of clever devices, or waste industrial heat and use those without the need to put an engine in place in the network itself. We have left some space for what we refer to as “inherently low emission CHP”. The concept behind this is that as some heat networks develop they may go through a phase where they need to have some sort of active heat generation, rather than relying on these renewable sources because there are scale issues, which I do not fully understand, but my managing colleague could explain it to you in exhaustive detail.

Ultimately we would like to see these things working on heat pumps. The two ways of managing that is to make sure that anything that does come forward of a sufficient scale, we think we want it enough to allow some form of on-site heat generation. We would want to see a transition plan as part of the initial set-up so we would know when it would finish and how it would finish and how it would progress on to renewable sources. Also, we are very clear that these would be considered on a case-by-case basis, which is a big difference from the previous London Plan where there was blanket support for the use of CHP.

The other thing I would draw your attention to is that we are talking about the air quality and climate change impacts. We are quite -- well, not “comfortable”, but we are aware of the fact that gas engines in particular are quite a lot more polluting than equivalent boilers, although other technology such as turbines are less so. There has been a lot of change in how the carbon emissions are understood from these forms of CHP and the overall understanding is that as the grid continues to decarbonise, albeit not fully decarbonised, the relative carbon benefits of having onsite CHP generation are starting to drop away. Therefore, you get less reduction in your net carbon emissions from your building by doing that. Accordingly, there is a good argument on both sides of moving away from combustion as our source of heat.

**Leonie Cooper AM (Deputy Chair):** That is talking quite a lot about new buildings and dealing with how we move into the future once the London Plan --and we are down in this room because the Examination in Public of the London Plan has just started in the Chamber. What about existing buildings? Professor Williams, earlier

on, was talking about boilers and Assembly Member Bailey was starting on that too. One of the ways to reduce emissions from boilers is to make them work less hard by insulating the building in which they are situated, and that also sits very well together with our climate targets and our Zero Carbon City target because the leakier the buildings are the more difficult they are to heat and the more likely you are to use more energy to do that. At the moment, obviously, most of the energy that is being used is going to be associated both with emissions that might impact on air quality and also emissions that will impact on climate change.

Consequently, I am asking really about things like our Fuel Poverty Action Plan, what we are going to do about it and more installation programmes and also progress, I think, on our Solar Action Plan and how does that fit together with reducing some of those non-road emissions.

**Stephen Inch (Senior Policy and Programme Officer, Air Quality, Greater London Authority):** I think the short answer is very well. For the longer answer I think I would either need to write back to you or refer to some of our colleagues who have worked directly on that.

**Leonie Cooper AM (Deputy Chair):** Just finally, we have talked a bit about the Government's newly launched Clean Air Strategy that came out on Monday, which did mention wood burning stoves and not using wet wood and banning that sort of thing. I do not seem to remember any mention of diesel scrappage, which we have not really talked about today. Congratulations to the Mayor for the £23 million fund. Would you have hoped to have seen diesel scrappage coming out in Monday's strategy from the Government and is that something that we have got any chance of persuading them towards a national diesel scrappage plan?

**Elliot Treharne (Head of Air Quality, Greater London Authority):** I think we were disappointed that that was not set out clearly in the Government's Clean Air Strategy. As you know, one of the main criticisms previously of the draft Strategy was it did not include much on road transport. While it is good that they are starting to think about the impact of PM2.5, I think a lot of stakeholders have highlighted that NO<sub>2</sub> compliance is not yet done; we have a long way to go. It is a difficult journey and it is important that we help businesses and low-income families and charities, who have bought vehicles in good faith as a result of Government advice to switch, now that we better understand or publicly it is better understood the impact of those vehicles on air pollution, that help is made available to meet new standards like those put in place by the ULEZ.

This is a national issue. We are not the only city looking at these kinds of schemes and we think it is very important that there is national funding. Even if that national funding is unused locally, that there is national funding to try to minimise, as far as possible, some of the potential impacts of these schemes. I think that this goes more widely to a point that you raised, Leonie [Cooper AM], earlier, that I think the Mayor is disappointed that there was not more in terms of help for London. London has probably the biggest air quality challenge in the country. As you mentioned we have been excluded from the Clean Air Fund which we do find very hard to understand why that is, given the scale of the ambition, the speed that we are going at, the size of things like the Ultra-Low Emission Zone that we are doing. It is bigger and quicker than anywhere else in the country and therefore the impacts are potentially larger and some of that funding should be coming to London.

Accordingly, I know that the Mayor will continue to discuss this with [Government] Ministers. It is a huge priority and we will see where we end up.

**Leonie Cooper AM (Deputy Chair):** Thank you, yes.



**Professor Martin Williams (Air Quality Research, King's College London):** I was going to make some more sort of general remarks, however if you have got specific questions then do not let me cut across you.

**Leonie Cooper AM (Deputy Chair):** No, I was --

**Professor Martin Williams (Air Quality Research, King's College London):** Before I do make any remarks, just on the diesel scrappage scheme, I was not particularly surprised not to see it there because there are conflicting views on the effectiveness of diesel scrappage schemes. At the time when I was in Defra when, if you remember, the industry was having trouble selling cars back in, I do not know, the mid-2000s we looked at potential scrappage schemes then and while they were effective at turning over the fleet to help the industry sell new cars they did not have much of an effect on air quality.

**Elliot Treharne (Head of Air Quality, Greater London Authority):** If I may, just on that, having had this discussion extensively with Defra, what the Mayor has been proposing is very different to just a general national scrappage scheme.

**Professor Martin Williams (Air Quality Research, King's College London):** I was about to say that a focused scrappage scheme could be a lot more effective and that is a tricky thing for a national Government to do --

**Elliot Treharne (Head of Air Quality, Greater London Authority):** What we can bring in -- absolutely. Yes.

**Professor Martin Williams (Air Quality Research, King's College London):** Anyway, that aside. The general point I was going to make was how welcome it is and what an excellent move it is that the GLA and the Mayor can actually integrate climate and air quality policies in London. Would that it were replicated at national and international level? It is a very welcome thing that the GLA can do and it is good to see. The problem is that their hands are slightly tied by national policies and you are having to catch up in a way. Things like the renewable heat initiative, for example, that has been actively encouraging the use of wood burning amongst other things, you know, and we are trying to sort of rein back from that. However, it is a really excellent thing, I think, that you can integrate at this level.

Just to come back to the Clean Air Strategy as an example, there is a phrase in the section that deals with climate change and air quality where - it is not verbatim so do not let me try to quote the precise words - it is a phrase to the effect that the Government will talk to various departments involved to articulate the trade-offs between climate change policy and air quality policy. Now, my personal view is that if I were writing that I would have preferred to have seen "will articulate and minimise the trade-offs." This is the sort of thing that can be done at this level, at the GLA, and that is precisely what Elliot has been talking about doing which is a really welcome thing.

However, both nationally and internationally, and the UK is not alone in this, most other countries around the world and international bodies like the EU and the UN Climate Change Convention do not really integrate climate and air quality policies. That is really a big major failing, I think, because one of the big ways forward to improve public health and air quality is to integrate climate and air quality policies. You mentioned the electrical vehicle needing not zero carbon emissions. Well, we are moving that way, you know, the UK energy infrastructure now has made a huge leap forward in the last five or ten years and renewables now make up a big slice of the generating capacity, thus that integration of climate and air quality policies is really crucial and it is really good to see it happening here.

**Leonie Cooper AM (Deputy Chair):** Much done, much to do and certainly some of us choose tariffs from our energy providers or choose energy providers that only source from renewables. I do that myself as well as having a solar array of my own. There has been a lot of work done. I think “articulate, minimise and remove, as far as possible”, would be the full phrase I would like to see.

**Professor Martin Williams (Air Quality Research, King’s College London):** Yes, right. We should have drafted it!

**Leonie Cooper AM (Deputy Chair):** I think there are a number of cities around the country, obviously smaller than London, small places like Manchester and all that kind of stuff, I think they are joining with us and moving ahead as well. UK100, I think, has been trying to co-ordinate work here and the C40 Cities Group internationally has been doing that. Even in America, where I believe the President [Donald Trump] appears to be a climate change denier, there are many cities across America that are still very strongly committed to tackling climate change. Air quality still seems to be further down the list of things to do. Thank you very much that is very welcome.

**Caroline Russell AM (Chair):** Well, that brings us to the end of our session this morning. I want to thank you all for the all the information you have given us. Clearly, we are just at the beginning of getting to a point where every Londoner can trust the air they breathe and there is clearly some very serious work to be done on the Underground and it would be very good to understand more what those issues are when we get further information from TfL.