



OFFICIAL REPORT
AITHISG OIFIGEIL

Environment, Climate Change and Land Reform Committee

Tuesday 14 November 2017

Session 5



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ENVIRONMENT, CLIMATE CHANGE AND LAND REFORM COMMITTEE
28th Meeting 2017, Session 5

CONVENER

*Graeme Dey (Angus South) (SNP)

DEPUTY CONVENER

*John Scott (Ayr) (Con)

COMMITTEE MEMBERS

*Claudia Beamish (South Scotland) (Lab)
*Donald Cameron (Highlands and Islands) (Con)
*Finlay Carson (Galloway and West Dumfries) (Con)
*Kate Forbes (Skye, Lochaber and Badenoch) (SNP)
*Emma Harper (South Scotland) (SNP)
*Richard Lyle (Uddingston and Bellshill) (SNP)
*Angus MacDonald (Falkirk East) (SNP)
*Mark Ruskell (Mid Scotland and Fife) (Green)
*David Stewart (Highlands and Islands) (Lab)

*attended

THE FOLLOWING ALSO PARTICIPATED:

David Duffy (Royal Environmental Health Institute of Scotland)
Dr Scott Hamilton (Ricardo Energy & Environment)
Vincent McNally (Glasgow City Council)
Dennis Milligan (Stove Industry Alliance)
Professor Mark Sutton (Centre for Ecology & Hydrology)

CLERK TO THE COMMITTEE

Lynn Tullis

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Environment, Climate Change and Land Reform Committee

Tuesday 14 November 2017

[The Convener opened the meeting at 10:02]

Decision on Taking Business in Private

The Convener (Graeme Dey): Good morning. Welcome to the 28th meeting in 2017 of the Environment, Climate Change and Land Reform Committee. I remind everyone present to switch off mobile phones and other electronic devices, as they may affect the broadcasting system. Agenda item 1 is to consider whether to take item 5 in private. Is that agreed?

Members indicated agreement.

Air Quality

10:02

The Convener: Item 2 is the continuation of evidence taking for the committee's inquiry into air quality in Scotland. The panel is David Duffy, junior vice-president, Royal Environmental Health Institute of Scotland; Dr Scott Hamilton, principal air quality consultant, Ricardo Energy & Environment; Vincent McNally, environmental health officer, Sustainable Glasgow, Glasgow City Council; Dennis Milligan, head of communications, Stove Industry Alliance; and Professor Mark Sutton, environmental physicist, Natural Environment Research Council, Centre for Ecology & Hydrology. I welcome all of you.

Members have a series of questions to ask you. We will kick off with Kate Forbes.

Kate Forbes (Skye, Lochaber and Badenoch) (SNP): Good morning to the panel. I would like to direct my first question to Professor Mark Sutton. How would you update "Cleaner Air for Scotland—The Road to a Healthier Future" to ensure a more integrative and cross-sectoral policy?

Professor Mark Sutton (Centre for Ecology & Hydrology): That is a tough one. I will speak as a scientist whose expertise is in agriculture and air pollution, especially in the nitrogen cycle. I realise that this committee deals with not just air pollution but other climate challenges; I am not sure whether biodiversity challenges are on your radar.

Air pollution should not be seen in isolation and the committee should realise that there are win-wins between different policy sectors. I am specifically an expert on the nitrogen cycle, so that is not a bad place to start. We are losing substantial amounts of nitrogen into the air as air pollution both as NO_x—nitrogen oxides—and as ammonia, which primarily comes from agriculture. That air pollution has value as nitrogen. When we equate that to the price of fertiliser, we see that we lose a substantial amount of resource when it turns into pollution, which should encourage us when looking at your question about more integration to think about the value of what has been lost—what started out as a resource and then became pollution where we did not want it.

To give an example on the agriculture side, the value of total European nitrogen emissions from agriculture alone is about €14 billion per year. That is about a quarter of the total common agricultural policy budget of €57 billion per year. Therefore we are losing massive value from agriculture. We are losing several further billion euros from nitrogen oxides—if we ever learn to not just destroy but capture nitrogen oxides as a resource, that might

help us go further than we have gone before on an international level.

On your question on integration and air quality, my first point is to think beyond air quality; think of pollutants as once having been resources that can help meet several other goals. For example, nitrogen contributes to air pollution, ammonia pollution affects biodiversity, and particulate matter and nitrogen oxides affect human health. They are all linked, so a circular economy perspective could help. That kind of thinking might help other sectors too, but I am less of an expert in those sectors.

Kate Forbes: Does Ricardo Energy & Environment consider the effectiveness of the strategy and its relevant policies to have been constrained by a lack of input from businesses and private sector organisations? Depending on your answer, how would you change that?

Dr Scott Hamilton (Ricardo Energy & Environment): From the outside looking in, it is quite difficult to understand the cleaner air for Scotland strategy in a lot of detail. We are not very involved in the evolution of the programme, although we do a lot of work for the Scottish Government: we run the measurement networks and manage the Scottish air quality database. However, we have not had much involvement in CAFS. We would probably have quite a lot to give to the process, but it was not possible, for whatever reason, to give it in our response to the consultation question.

The focus of CAFS is naturally on road traffic, but there are other sectors that are important for air pollution in Scotland, such as the industrial and commercial sectors. There is not a lot of focus on any other source types in CAFS that private industry might be interested in, for example if there were additional controls on emissions from commercial or industrial sectors.

Kate Forbes: Good. Does Glasgow City Council monitor progress on air quality targets? What performance indicators would be useful at a national level in light of your experience at a local level?

Vincent McInally (Glasgow City Council): Glasgow reports on air quality, which is monitored across the city, in its annual progress report. We have an extensive network of more than 100 monitoring locations across the city. The trends have generally shown improvement over the past five years. We have monitoring data going back much longer than that. The network has been expanded year on year. We are in the process of adding more PM_{2.5} monitors, which should be in place for the start of 2018.

The performance indicators that are important for the city are the trend in air quality in Glasgow and the levels of air pollution that have been

recorded. It is generally a good-news story in Glasgow. More than 97 per cent of the city meets all air quality targets, including the Scottish and World Health Organization targets for particulates, which are the most demanding in the United Kingdom and Europe. Those performance indicators show where we are and how well we are doing.

The Convener: I want to bring in a couple of members who have slightly tangential questions around monitoring.

Emma Harper (South Scotland) (SNP): I am interested in monitoring around schools. For example, has Glasgow City Council thought about putting NO_x pollution monitors on lollipop people? That would allow you to measure what is happening at school time, when school pupils go in and out and whether there is an issue between times.

Vincent McInally: The local air quality management regime is quite clear about suitable monitoring locations. It is not based on personal exposure, as in the example that you have suggested, or on people walking about wearing something. It is based on fixed monitoring locations.

We are lucky in that there are no schools in Glasgow where air quality targets are not being met. We have air quality monitoring stations in schools; we have a full station in one school and at other schools in the city centre we have located NO₂ diffusion tubes to provide comfort to parents and concerned citizens that air quality targets are being met in the schools.

That monitoring is positive in terms of what is being found. However, there are still issues with kids having to walk past lines of cars idling, perhaps with parents waiting to pick them up at the school gates. The objectives that we are required to meet are not being exceeded at those locations, but it is exposure to pollution that would be better avoided. To that end, in the past we have carried out vehicle idling enforcement outside schools and have issued fixed-penalty notices to parents picking up schoolchildren. That was not very well received, but it has to be done.

Dr Hamilton: We are talking about very small concentrations of trace gases, and it is very challenging to measure gases and particles at the concentrations that are represented in the standards. To my knowledge, for the purposes of personal measurements, there are no portable measurement methods that would be sensitive enough to characterise air pollution at the levels that we would typically understand as being problematic. The uncertainty in such personal measurements would be very high; it would be very difficult to reproduce them and be confident

that they were reliable. That is a technological issue—right now we do not have the measurement methods available to allow us to do that.

John Scott (Ayr) (Con): I want to go beyond monitoring and develop Professor Sutton's idea about NO_x gases and ammonia. We had a long conversation at the NERC on the subject. Is there any clever chemistry that could treat those gases as a resource and something to be harvested? The €14 billion-worth of nitrogen is not all wasted, but certainly there must be some run-off in agriculture, as well as roadside gases that could be harvested. It is self-evident that grasses on roadside verges grow better close to the road than they do even 10 feet away. That is a function of the nitrogen element of the pollution. Is there any clever chemistry that would allow us to turn that into a resource and an asset?

Professor Sutton: We are at the cusp of that discussion, because some technologies are beginning to run and others are still in our minds. The first stage is the change of thinking towards asking what we can achieve in that respect. At the moment we can see some possibilities in technologies to reuse liquid streams from farming. For example, a set of cows or pigs produce urine and solid manure, which typically nowadays will just be put straight back on to a field with a surface spreader. The problem with that is that, because it covers all the surface, it gives so much up into the atmosphere, and the main pollutant is ammonia.

10:15

In some parts of Europe—curiously enough, this is driven by the nitrates directive, so there is a link between air pollution and another policy domain—farmers cannot put more than a certain amount of organic manure on to a field, so they pay somebody else to take it away. The guy who takes it away now has a bit of money and the manure. First, he does anaerobic digestion and gets some methane off it. He is left with a liquor that is rich in nitrogen and phosphorus, which he warms a bit, stripping off the ammonia, and puts together with an acid. He then sells the product back to the fertiliser companies. That is the basis of a circular economy, and it is already happening. Of course, the question is how to make it profitable.

The NO_x come from another angle entirely—our vehicle exhausts. To date, all our technologies focus on turning the NO_x back into atmospheric nitrogen, which is the form N₂—78 per cent of every breath that we take is N₂, but it is completely unreactive and not much use for anything apart from providing a nice stable atmosphere. However, if we can get the NO_x and turn it into nitrate, again we have a potential resource. We are still at the cusp of development on that, and

we are a long way away from making that economic. The world's nitrogen oxides emissions are about 40 million tonnes a year, which is something like \$40 billion-worth, which we currently treat as pollution. The question is whether, in future, we can improve our technologies to wash that out commercially and then of course bring down the price of air pollution abatement.

The point about roadside verges is interesting. Again, the challenge that we face is to make such an approach economic so that, whoever is managing the verges, whether it is a roadside company or a farmer, gets enough to make it worth his while. If field drains are not being run well, there might be substantial nitrate leaching from them. It is a challenge for the future to capture that nitrate and get it back to the farm and back on to the crop where we want it.

John Scott: Forgive me for being so stupid—my chemistry is very out of date—but what is the equation that takes N₂O to nitrogen plus oxygen? How do you split up that molecule? There will be a piece of chemistry somewhere, although I do not remember what it is.

Professor Sutton: Yes, there are several ways of doing it. The first thing to realise is that nitrogen is a bit challenging, because it has several forms. The first form is N₂, which is two nitrogen atoms together and that is what makes up 78 per cent of every breath that we take. The next form, which you just mentioned, is N₂O which is a greenhouse gas and which is really unreactive so, once we have lost it, it is hard to do much with it.

John Scott: I actually meant NO₂.

Professor Sutton: The next one is NO, or nitric oxide, which very rapidly forms nitrogen dioxide, which is the one that we are used to in cities. If you add a bit more oxygen, you can convert that NO₂ into nitrate, which is NO₃. That might be done in a number of ways, but basically it involves using an oxygen-rich source to convert NO to nitrate.

Dr Hamilton: The simple answer to John Scott's first question is no—right now, there is no technology to remove NO_x from the atmosphere at the roadside that would align with the CAFS objectives of reducing exposure to NO₂. The compounding factor is that traffic emissions are a complex mixture of NO_x, volatile organic compounds and other particles such as metals. I imagine that there would be an issue of having to deal with those sort of nasties alongside the thing that we want to keep. However, right now, there is no technology to reliably do that.

John Scott: No, but there is a simple natural technology of grasses, which obviously absorb the nitrogen compounds. It is manifest that those compounds and probably also sulphur help the

growth of grasses. Therefore, I presume that environmental enhancements such as grass or trees by the roadside capture some of those gases. Is that correct?

Dr Hamilton: I am primarily an air quality modeller and atmospheric scientist. My experience thus far is that grass has absolutely no effect on concentrations. Roadside trees can have an effect but it can be a compounding effect through slowing down wind speed, which increases concentrations of some gases. There is no straightforward fix, unfortunately. Reducing emissions at source is the most reliable way of dealing with the issue, rather than dealing with the emissions once they have been released from the source.

The Convener: I do not want to get bogged down in this, but Mark Sutton wants to come back in briefly.

Professor Sutton: We broadly agree. The key thing is that once emissions are out in the atmosphere, they are hard to deal with. You want either to be not emitting or capturing the emissions at source.

On roadside verge vegetation being used to capture emissions, we have to make a distinction. There are higher levels of emissions near roadside verges, which means that the dose to that vegetation will be bigger than it would be if it was not near a road. That can start affecting biodiversity—if you are trying to protect biodiversity near roads. However, in quantity terms, a very small fraction of gases will be removed from the air.

When it comes to NO_x, the debate about trees in the environment is challenging. The main benefit and threat is through the dispersion effect. On the other side of the trees, the air might have been dispersed better and there will be better air quality, but in the street canyon that is protected by trees, higher concentrations will be experienced.

The final distinction to make is that different gases have different removal rates. The NO₂ that comes out of cars deposits very slowly, which means there is very little potential for recapture. Ammonia deposits faster—some ammonia comes out of catalytic converters. Removal rates depend on the gas.

Vincent McNally: In Glasgow, we have introduced what are called CityTrees. They are freestanding walls that are planted with particular herbs and mosses that have been shown to be effective at capturing pollutants from the air. They are freestanding units. They are much cheaper to install than planting a tree in an urban environment. They are self-contained in that they capture their own rain water and their pumps are

solar powered. It might be an option for us to introduce more of them in the future.

The Convener: That sounds fascinating. I have another question about the Hope Street hotspot. As I understand it, the monitoring station is very close to a taxi rank. Is that the case?

Vincent McNally: Maybe the taxis are close to the monitoring station. They are further away now than they used to be because we put up new bollards to prevent taxis from backing up to the station. Hope Street is very busy and the taxis contribute to its levels of pollution. The monitoring station captures everything in that street and the modelling that has been done on air quality in Hope Street takes account of that.

The Convener: The modelling is not skewed by the fact that the taxis are so close to the monitoring station.

Vincent McNally: The station captures the correct levels of pollution in the street.

The Convener: Given your earlier comments about issuing fixed-penalty notices outside schools, has the council taken any action of that type with the taxi ranks when taxis are found idling?

Vincent McNally: We have taken a lot of action against taxi drivers and bus drivers, to the point at which they recognise the enforcement officers before they get to them.

There is a problem with taxi ranks in that the official guidance says that the vehicle has to be idling unnecessarily, and that is generally taken to mean that it has been sitting there for more than a couple of minutes. It does not have to be two minutes. If the driver is outside smoking a cigarette and his engine is on, he can get a ticket straight away. The taxi has to be idling unnecessarily, but taxis in ranks move up quickly and do not stay stationary long enough for us to issue a ticket. When we time them, it is literally 30 seconds before they creep up the rank and we have to start the clock again, which means that we cannot issue them with a ticket.

The Convener: It is good to get that on the record. Kate—do you want to continue?

Kate Forbes: I have two final questions, which I will ask together, in the interests of time. The first is directed at Dennis Milligan and David Duffy.

Can you enlighten us about the studies that have been carried out on the impact of domestic wood burning on air quality? Is it possible to estimate how much wood is burned domestically in Scotland and to differentiate the amounts that are burned on open fires, approved wood-burning stoves and unapproved stoves?

My second question is a free-for-all. Do you believe that the Clean Air Act 1994 deals effectively with emissions, is it adequately enforced, and how should it be amended?

Dennis Milligan (Stove Industry Alliance): The Department for Business, Energy and Industrial Strategy study that looked at domestic wood usage in 2015 showed that 40 per cent of the wood that was burned in Scotland was burned in open fires. We argue that that is the worst way to burn wood. By controlling the burn, it is possible to control the resulting emissions, because most PM from wood burning is caused by incomplete combustion of the wood. In an open fire, there is a lot of incomplete combustion, so there are more emissions.

Earlier this year, Dr Fuller of King's College London presented a study that looked at all the monitoring stations in the UK. He found that the level of emissions from wood burning was dropping slightly in Glasgow and Edinburgh. He put that down to replacement of open fires and older stoves with stoves that are exempt under the Department for Environment, Food and Rural Affairs system.

We are trying to educate people about the new European ecodesign control for emissions, which is due to come in for wood-burning stoves in 2022. As an association, we are bringing in those emission levels now, and we have committed to meeting them by 2020. That will reduce emissions to 55 per cent less than a DEFRA-exempt stove, and to 90 per cent less than an open fire or a stove that was manufactured 10 years ago. The technology has moved on—we can now capture the emissions within the stove before they are released into the atmosphere.

The Convener: Can anyone quantify the extent to which fires and stoves are part of the problem? Are they a significant contributor to air pollution, or a minor one?

David Duffy (Royal Environmental Health Institute of Scotland): That is not completely known because of the way in which stoves come into use. In response to Kate Forbes's question, the Clean Air Act 1993 provides some exemptions for smoke-control areas, and a number of restrictions on the types of stove that can be used in those areas. However, the smoke-control areas were set up, historically, in line with where coal was being delivered, in order to tackle the problem that the previous Clean Air Acts had sought to address.

At the moment, a culture is being created in which people are being encouraged to use wood-burning stoves or other methods of burning. That is causing a conflict between climate change and air quality, in that we are encouraging people to

use what we see as a renewable resource, but that resource produces more pollution if it is used incorrectly.

Part of the problem is that there is a gap in the development control of stove installation, in that installation might not be subject to building control. People who have existing chimneys or existing pots might not need to get planning permission to put in a stove. People will install stoves without considering planning requirements or their neighbours.

Although stoves can be very efficient and can meet air quality targets, there is an unregulated gap. Questions were asked about that in the consultation on the Clean Air Act 1993, and REHIS and other agencies have highlighted the problem. We believe that there is a gap, but it is difficult to demonstrate exactly where the problem lies. Many of the measures in CAFS are aimed at transport issues, rather than at other areas that contribute to pollution, including agriculture, domestic burning and heating. The perceived problem with stoves might not be fully understood.

Dr Hamilton: Back in 2008, my organisation did some research for the Scottish Government, which published a paper on the subject of wood burning in cities and what that might be contributing by way of PM₁₀ and PM_{2.5}. That research is now quite out of date. The last time we looked, we reckoned that wood burning was probably contributing about 1 microgram or so of PM₁₀ per cubic metre and a bit less than that of PM_{2.5}. That was in Edinburgh and Dundee; we did not look at Glasgow in that study. There is not much reason to suspect that the situation has changed very much. That was the last time that we looked holistically at a large area of Scotland and tried to quantify the effect of wood burning.

10:30

David Duffy: REHIS, which is a professional institute, helps to support a forum called the Scottish pollution control co-ordinating committee, or SPCCC, in which local authorities and SEPA engage with Scottish Government officials. When planners spoke to the SPCCC about another topic, they brought up the idea of permitted development rights for installation of stoves and asked whether a baseline on emissions could be drawn up. That information was given to the planners, but we have not seen anything come forward since then. That information would help with future developments and sites that we come across, because we could say to those who meet the permitted development rights that they do not have to apply for planning permission because what they have in place is satisfactory.

The problems that come back from the forum, which represents the 32 local authorities, relate to when an unregulated unit has been put in and, because of the chimney height, the exhaust fume is pluming down and affecting someone else. Although those occurrences provide a small contribution to the overall air quality figures for Scotland, they represent problems at a very local level that must be tackled.

On the one hand, perceived building regulations and planning requirements are being met and the installation of the stoves is authorised by the local authority, which is not impacted; on the other hand, environmental health departments, which I am speaking on behalf of, are telling people that they cannot have a stove in a certain position because it is affecting someone next to it. It would be beneficial if the gap in the development process were to be controlled; it would also be beneficial to get assistance to inform the public what they can do with stoves before they go ahead and install one.

Dennis Milligan: I have two points to make. First, in England and Wales, planning to install a stove is a notifiable event. Therefore, building control is immediately involved—or the matter is handed to a competent person who is authorised to survey and install the stove. I did not realise that installing a stove is not a notifiable event in Scotland. Adopting that measure would be an improvement, because it would ensure that the installation is properly covered and that it does its best to disperse the emissions.

Secondly, I will comment on the impact of stoves. I rely a lot on King's College London for my learning. I apologise for using a London example. Dr Fuller of King's College estimates that, in the winter-time peak of PM emissions, wood burning contributes about 10 per cent, but 70 per cent of the wood is burned on open fires. Two weeks ago, we had that conversation with the Mayor of London's office. It accepts that the problem in smoke-control areas is the inability to control how the wood is burned.

David Duffy: There are development restrictions in smoke-control areas. There is a defined list of stoves that must meet a certain efficiency level within a smoke-control area.

Donald Cameron (Highlands and Islands) (Con): My question follows on from the convener's question. I am struggling to hear any concrete evidence about whether wood burning is a problem in Scotland, and it is essential to the debate that we know the answer to that. We have a representative from Glasgow on the panel. Is there an urban-rural issue here? Do people complain about pollution from wood-burning stoves and so on? To what extent is it a problem?

Vincent McNally: The answer is yes—people complain to us. However, the complaints are more about the odours that are associated with wood burning than they are to express concern about pollutants. Is it a huge problem? Are there a large number of complaints? No. That is perhaps due to the number of installations that have been done.

I will pick up on a couple of issues. We do not have open fires in Glasgow—it is a smoke-control area, so wood must be burned in an approved appliance.

The Clean Air Act 1956 and the Clean Air Act 1968 were probably the most significant pieces of public health legislation to have been introduced in the UK because they allowed local authorities to prohibit burning of solid fuels in their areas. The move towards burning wood and solid fuels is a backwards step in areas where we have concerns about air quality. There is no evidence that it is a huge problem at the moment, but we need to keep a watchful eye on it to see whether it becomes more popular or trendy to have wood-burning stoves.

Wood-burning stoves can be laboratory tested to show that they are very clean when they are run exactly as they are supposed to be operated, but we have no control over what people put in the fireplace on a dark night in a tenement where nobody can see what goes on the fire. The natural human tendency is to think, "Oh, I'll just chuck it in". What are the emissions that come from that? There are concerns that Glasgow City Council, as a local authority, does not have an evidence base to show the impact on levels of pollution.

Donald Cameron: If you were to try to apportion the percentage of emissions or pollution that comes from stoves in Glasgow, could you put a figure on that? I know that that is an unfair question.

Vincent McNally: No, I could not give a figure. The percentage would vary from street to street and area to area.

Claudia Beamish (South Scotland) (Lab): Good morning to all the witnesses. My question is for Dennis Milligan. Your written evidence highlighted the issue of an incentive scheme to encourage the replacement of open fires and older stoves with, as you term it, an "Ecodesign Ready stove". Is there a tension or conflict with the renewable heat incentive for that scheme?

Dennis Milligan: Wood-burning stoves are not part of the RHI. They are hard to fit in to that model, because they are manual batch-fed stoves, so there is no incentive for people to put in a wood-burning stove.

Our view is that technology has moved on so much in the past 10 years, and continues to move on, so it is important to bring existing stock up to date. We are in on-going discussions with DEFRA to bring in an upgrade scheme. When we spoke the Mayor of London's office about the scheme, it got excited because it recognises that, even though London has the Clean Air Acts, 70 per cent of the wood that is burned is burned on open fires. Under the legislation, people are not meant to burn wood on open fires in smokeless zones, except in exempted appliances, but a lot of people do it. The upgrade scheme is to encourage people to move forward. Enforcement seems to be difficult in relation to wood burning.

Claudia Beamish: That was helpful. Thank you.

Emma Harper: Tomorrow will be world chronic obstructive pulmonary disease day; Parliament will have a debate tonight at which members will speak about COPD and raise awareness. The evidence is that poorer air quality exacerbates existing lung conditions, especially in vulnerable people. It is important to highlight that.

I am interested to hear how Scotland's cities compare to other European cities, especially those that are leading in active travel. Is the CAFS vision of our air quality being equivalent to or the best in Europe feasible?

Dr Hamilton: Scotland's air quality story is very good in most cases. We have isolated problems with air pollution but, generally, the country benefits from being surrounded by ocean on three sides; we do not have many large polluting neighbours.

The European Environment Agency publishes each year Europe-wide statistics and comparisons between regions. If we take Scotland in the round, it always comes out very favourably in comparison with other European countries. The outlier is NO₂. We have a very low particle climate compared with other countries. I have done a lot of work in China recently, which has quite low concentrations of NO₂ compared to PM, but Scotland is the opposite—we have a lot of NO₂ and not much PM. That points to the UK having a specific issue of using a lot of diesel; the manifestation of that is a lot of NO₂ in the atmosphere.

Typically, exceedances of standards are very marginal. Cases like Hope Street, which has been mentioned, are specific hotspots and are almost as much an engineering problem as they are anything else.

Angus MacDonald (Falkirk East) (SNP): I want to pick up on the issue of hotspots. I represent Grangemouth, which, it is fair to say, has faced many challenges in the past in respect of air quality. There have been several breaches involving excess sulphur dioxide in my

constituency, which has resulted in an air quality management area specifically for SO₂. Ineos has invested just over £70 million in a sulphur recovery unit at the refinery. Removing sulphur from fuel as close to source as possible is a good thing.

I understand that the UK exceedence levels are more stringent than the European Union levels, and Ineos has often told me that its breaches were of UK levels rather than EU ones. Can you explain the difference between the EU levels and the UK/Scottish ones? How does that fit with monitoring?

Dr Hamilton: I am not an industrial modeller, so I do not do much work on SO₂, but the UK domestic standards for SO₂ are more stringent in that one of the UK objectives does not exist in European legislation. The 15-minute standard is way more stringent in the UK than in Europe. The reason for that is that SO₂ has an acute action on human health, whereas NO₂ is more a contributor to chronic health deterioration. I cannot comment on the rationale behind the adoption of a more stringent standard in the UK than there is in Europe.

Professor Sutton: I will reflect on the comment on particulate matter and the cleanness of Scotland's atmosphere compared to some in other regions in the world. I am very happy that we do not have Delhi's air pollution, but that is no reason for complacency. There is a distinction between meeting a target value and having no air pollution effects at all. The target values are the outcome of a set of complex negotiations about how much we are ready to agree to go for, but I understand, from the effects scientists, that we do not have a threshold for the human health impacts of particulate matter—all particles are bad. Even if the particle limit is so many micrograms per cubic metre and the reality is a little bit less than that, that does not mean that there is no impact—there are still impacts.

As we have seen in the air monitoring data and modelling, Scotland occasionally gets high levels of pollution coming across from continental Europe. It is, therefore, about a combination of managing our local sources—what happens in our cities—and managing the widespread sources from across the countryside and across Europe. Even before such pollution enters the cities, the background levels can be very high.

The Convener: On the subject of cities, is there a European league table for cities similar to Glasgow and Edinburgh to show how they are performing? If so, and if there are cities that are doing better than ours, what are they doing differently? Does Vince McNally have any comment to make?

Vincent McNally: I thought that that question would come to me. In the past three weeks, there have been articles in a couple of newspapers that have suggested that Glasgow is the worst city in the UK for air quality. That came as news to me even though I work in air quality, and I am sure that it was news to everyone who has ever ventured further than Glasgow—for example, to London or Birmingham, where air quality is much more of a problem.

League tables are probably not useful in reflecting the differences in air quality, because they do not necessarily look at the number of people who are exposed and the areas to which the high pollution levels are confined. For example, Hope Street fails to meet the objective for the annual mean, but there are no residential properties in that area. The levels are higher but people do not live in that area, so it is not as bad as an exceedance of an objective in an area where large numbers of people live or where schools are located. There is no real league table as such.

I echo the comments that have been made. The air quality in Scotland, including in Glasgow, is generally really good. Particulates have been identified as the most harmful component of air pollution, and we meet the Scottish and WHO objectives for both PM₁₀ and PM_{2.5}. A newspaper article inaccurately reported on data from 2013. The level of pollution from particulates has dropped right across Scotland, including in Glasgow, and all the objectives have been met.

10:45

Dr Hamilton: I sound a note of caution about the interpretation of league tables. The WHO and the European Environment Agency publish league tables every year, and the concentrations that are reported in them are very sensitive to where the analyser who reports the measurements is placed. It is not true that Hope Street is representative of the city, but it is in the league tables. Unfair distinctions are made when the sites do not have exactly the same conditions—and there is no way that sites across the whole of Europe have exactly the same conditions.

Mark Ruskell (Mid Scotland and Fife) (Green): It is difficult to assess the impacts of individual streets on individual people, let alone compare them through league tables. I used to work in an office in Hope Street and spent around nine hours a day there, so the air quality has perhaps had a greater impact on my health than it has had on the health of somebody who just walks through the area.

The debate goes back to health. In looking at air quality management areas and chasing limit

values, what are the health data? How many lives will we save if we reduce PM₁₀ or NO_x levels by a certain value over time? What data are there on the impact of that? We could be comparing one city with another or one area with another without any meaningful analysis of what happens if air pollution is reduced.

Dr Hamilton: We do not typically make that quantification at a sub-urban level, if we are talking about a street or a group of streets in a city, although there are methods of doing that. The Department for Environment, Food and Rural Affairs publishes a series of damage costs that relate to, for instance, a tonne of PM₁₀ being emitted in a city, whereby the damage cost to society in pounds will be X. The damage cost is way higher for PM than for NO_x, but we do not typically break that down to a street level. Sometimes, an engineering fix rather than a broad, strategic fix is required.

David Duffy: The way in which air quality management action plan funds are allocated must be justified. If a measure is designated, it has to be stated what the quantifiable improvement is. One of the CAFS statements is that health boards now have to include air quality in their joint health protection plans. As a nation, we are arguably including the health boards with the scientists, the local authorities, transport and the planners much better than we have done historically. Therefore, there is an opportunity for Scotland to improve its already excellent air quality. There are local hotspots but, as a whole, Scotland is looking at—and has to look at—joint health partnership plans to consider the impact of recognised pollutants. That work has started, and we will see how it develops.

Mark Ruskell: You say that Scotland's air quality is "excellent", but figures show that 2,500 people die every year because of air quality issues. Is that what "excellent" looks like? Does "excellent" mean 100 or 1,000 people dying? It is difficult to get a sense of the goal that we are chasing. What is an acceptable number of deaths from air quality issues? What must we tick before we can say, "We've done that. That's great. Let's move on"?

David Duffy: As the other scientists have possibly told you, no one has said that there is a target to reach that will be achieved. We seem to be on a journey towards improving as a whole; the title "Cleaner Air for Scotland" does not set an end point for that. The risks to human health change. In the past, it was apparent where smogs and pollutants caused deaths, as they were instantaneous, but we are struggling with more chronic conditions now. In contributing to the improvement of air quality, we will, by default, improve the health numbers.

What I am saying about the excellent air quality is supported by the other comments. Scotland as a whole has good air quality, but there are areas that we need to tackle. That is what we hear back through our membership and from the local authorities.

Emma Harper: I should have declared my interest as a registered nurse, because I am asking questions about health. This one is for Vincent McNally. You talked about how people in Glasgow get upset if they are given a fixed-penalty notice when they are idling their cars outside schools. Are adequate resources directed at guidance and information to enable people to understand why that is really important?

What would a low-emission zone for Glasgow look like anatomically? Would it be 20km²? Antwerp launched its low-emission zone in February, and it is 20km² in the city centre. There are park-and-ride facilities, and licence plates are photographed. What would Glasgow's zone look like?

Vincent McNally: I will answer the resources question first. We could always have more resources for engaging with the public and getting the message across. That is a key deliverable under communications in the CAFS strategy, and it is to be done across Scotland.

Every year, Glasgow City Council works in co-operation with the neighbouring authorities to run a no-idling campaign. The extent of that campaign is limited by the grant that we get from the Scottish Government. We are grateful for that funding but, if we had more, we could do more advertising and awareness raising. In the past, we have run television, radio, newspaper and billboard adverts. This year, the funding meant that we were limited to advertising on billboards and the backs of buses to encourage people to switch their engines off.

The CityTree helps to remove pollutants from the air, but the structure has information panels on the side of it to encourage the public to visit air quality websites and be aware of how they are contributing to pollution levels, so it is also about raising awareness.

SEPA has engaged with a lot of schools. It is an excellent idea to encourage the kids to nag their parents into walking them to school. My kids prefer to walk or use their scooters to get to school.

More could be done, and the more resources that we have, the more we can do.

What a low-emission zone for Glasgow would look like is a huge question. At the end of September—I think that it was on 29 September—the idea was put to our committee and there was agreement in principle to introduce a low-emission

zone in 2018. However, it will be towards the end of 2018 before that low-emission zone is in place.

The exact details of it will be subject to the work of the delivery group that has been formed, which comprises various parts of Glasgow City Council including transport guys, environment guys and people from equalities, planning, legal services and procurement. A huge delivery group is being formed, and it includes outside agencies such as Transport Scotland, SEPA and SPT. In addition, a delivery forum is being set up specifically to engage with stakeholders: the fleet operators, the bus operators, the chamber of commerce and anybody else who will be impacted by the low-emission zone.

It is not really for us, at this stage, to say how the low-emission zone will look; we need to engage with stakeholders and get feedback from them that will help to shape the zone so that it will be effective. Having said that, it is clear that the boundary that is being considered for the zone at the moment is approximately equivalent to the existing city-centre air quality management area. That is not to say that it will be exactly the same, but it will be approximately the same. That area is bounded by the M8 to the west and north, the Clyde to the south and the Saltmarket and High Street area to the east. Nevertheless, it is yet to be confirmed where the LEZ will be, as that will be subject to further work through the delivery group and the delivery forum.

The Convener: We have strayed into the subject of low-emission zones, and I want to develop that theme in a second, with David Stewart. Mark Sutton has a brief comment to make.

Professor Sutton: It is a quick response to Mark Ruskell's challenging question. As a scientist, I tend to think that we cannot tell you what number of deaths is acceptable. That ball is probably in your court. However, the discussion about Scotland having relatively good air quality, whatever "relatively" means, compared to other countries is only one way of looking at it—the one that asks how much we are affected by pollution. Our emissions are going up into the air and, in the international context, contributing to a higher background level of emissions in other parts of Europe. Our emissions—particularly the large-scale secondary particulate matter—contribute to air pollution in other parts of Europe, so it is not a matter of saying that, because we have relatively good air quality, we do not have a problem. We have a problem because we are contributing to other people's air pollution across Europe.

The Convener: Thank you. David, do you want to explore low-emission zones?

David Stewart (Highlands and Islands) (Lab):

Yes. I will start with a question for Mr McNally, for understandable reasons, but will then throw it open to the rest of the panel.

Mr McNally, will you have the LEZ up and running by next year?

Vincent McNally: The LEZ will be in place for 2018. That is in the committee paper that has been passed by Glasgow City Council.

David Stewart: When you gave evidence in May, you said:

"A pilot of a low-emission zone would be dependent on what resources and funding would be available. As yet, we do not have that information."—[*Official Report, Environment, Climate Change and Land Reform Committee*, 2 May 2017; c 42.]

Have you moved on considerably since you made that statement?

Vincent McNally: Not in relation to funding. The funding for the low-emission zone is not clear. That is expected, I think, on 14 December, when the Scottish Government's budget will be announced. We should be clearer then about what resources will be available for it.

There will be a low-emission zone in place for 2018. Exactly what it will look like and how ambitious it will be will depend on the resources that are made available and will be subject to further discussions as the delivery group progresses.

David Stewart: An issue that has been raised in the previous evidence that we have taken—you might have picked up on it—is the use of technology. In London, vehicle recognition technology can detect registration numbers and check whether vehicles meet the Euro 6 emissions standard. I understand that Edinburgh has the same technology for bus lanes. Do you have technology in place that can detect 360 degrees around a potential LEZ in central Glasgow?

Vincent McNally: We have automatic number plate recognition cameras that are linked to our bus lane enforcement. Are they in place now in a way that would be sufficient for a low-emission zone? No.

David Stewart: Clearly, then, that is a budgetary issue. You will need to know what budget is available in order to know whether you can roll out that technology. I presume that, even if you had the budget today, it would be quite a big technological leap to have it all up and running even in 12 months' time. Is there a chance that we could have an LEZ in name only in Glasgow next year, to come into force a couple of years after that?

Vincent McNally: The low-emission zone will be in place for 2018. I think that you are talking about when the enforcement will come in.

David Stewart: That is correct.

Vincent McNally: Even once the low-emission zone is in place, there will need to be, if you like, a sunset period for businesses and owners of vehicles to ensure that their vehicles are compliant. It would be unrealistic to expect, as of 2018, 100 per cent compliance by all buses, trucks and cars in the low-emission zone. Given that we are talking about such a large area, there must be time for the business community and fleet operators to ensure that their vehicles are of a standard that will be compliant.

David Stewart: Have you looked at best practice? There is an argument about this, but my experience is that London is quite far forward. There has been a congestion charge zone there for some time, and an ultra-low-emission zone is being brought in. Have you shared experiences with other cities? LEZs are not exactly new. We have LEZs across Europe, so there is an argument that we do not need a pilot at all. Have you looked at best practice and said, "They made a mistake on that—we won't do that"? Have you looked at the positives and negatives of LEZs?

Vincent McNally: Yes. We have been doing that in Glasgow for quite a while. It has become apparent that, because we have a problem with NO₂ and not with PM₁₀, the emission standards that we require are Euro 6 for diesel vehicles, whether they are heavy duty vehicles or passenger cars, and Euro 4 for petrol vehicles.

Those are very demanding standards—much higher than what is being asked for anywhere else in the rest of Europe, and equivalent to what will be asked for in the London ultra-low-emission zone. The current low-emission zone in London does not ask for emission standards as high as those that we will ask for in Glasgow, although the ultra-low-emission zone will have a similar standard. The standard will be monitored by means of automatic number plate cameras.

11:00

David Stewart: That is to be applauded. We should congratulate you on setting a high standard.

The Convener: To be clear, what would be a reasonable sunset period?

Vincent McNally: It would be unfair to say at the moment, because we have to engage properly with the stakeholders. The idea is that there has to be proper engagement before the low-emission zone is put in; it is not for us as a local authority to

say that it will come in on a certain date without any consultation or engagement.

The Convener: Two questions arise from that. In ballpark terms, are we talking about a couple of years, five years or 10 years? Secondly, have those conversations already started?

Vincent McNally: The conversations have started with some stakeholders in the engagement process that has been going on through the CAFS strategy, and in what has been done at a local level by Glasgow City Council.

We are talking about the medium term for some vehicles. Buses, for example, can be retrofitted: a new exhaust system can be fitted on to a bus. However, a van or a car would have to be replaced, so a longer sunset period will be needed for owners of those vehicles to become compliant.

David Stewart: You predicted my next question. I seem to remember you saying that Glasgow had an incentive scheme for retrofitting buses. Am I correct about that?

Vincent McNally: We tried to offer grant funding for the retrofitting of buses and we offered 80 per cent of the cost. Those funds were made available by Glasgow City Council, the Scottish Government and SPT. However, we had no uptake from any bus operators. There was interest, but nobody went through with it.

David Stewart: I am extremely surprised about that. We have had evidence from bus companies and, obviously, they know that there will be an LEZ and they know about Euro 6—there are some knowns. Why are they not taking up that excellent offer?

Vincent McNally: I should be clear that that was a few years ago, before a low-emission zone was on the cards.

David Stewart: So it could be a different context now. As you will know, a bus company told us that there is a worry that although once we create LEZs throughout Scotland we will have Euro 6-compatible buses in them, there could be a trickle-down effect so that the older, more run-down buses end up in areas outwith the LEZs. We do not want that.

There are wider issues about people no longer having the same bus choices if companies have to increase their bus charges or if we lose availability of bus routes. However, that is an issue for another day.

Will the incentive scheme still be up and running when the LEZ is announced?

Vincent McNally: That will be subject to the funds that are made available in December, as we do not have a budget at the council now for retrofitting buses. The money was available a

number of years ago, but there was no uptake and we ended up buying two fully electric buses for provision in Glasgow. Those buses run on the 100 service in the city.

The point about the grant funding being made available for retrofitting buses is that there will be interest in taking up such funds now that there is a low-emission zone coming into place, and that making funding available for bus operators will be key to delivering a successful low-emission zone. The feedback from bus operators is that, if they need to spend £15,000 to upgrade a bus and they have several hundred buses to upgrade, there will be an inevitable increase in charges and bus fares. As an air quality specialist, the last thing that I want is people being put off from using public transport and deciding to go back to using their cars.

For a couple of reasons, I do not think that displacement will be as much of a concern. We are talking about first targeting the older buses in the areas where the highest levels of pollution are being recorded, as it seems appropriate that that is where to target the effort. The buses do not need to go anywhere else; they can be retrofitted so that the same bus with a new exhaust system can run in the same place. The benefits from those buses extend beyond the immediate low-emission zone in Glasgow, because the buses run in a number of areas.

The final point is that low-emission zones are expected in a number of cities in Scotland. That is a good thing, because there would be no point in displacing buses if other cities come on board and decide that they will have a low-emission zone.

David Stewart: That is very helpful.

My final question is for all the panel. There is an argument that LEZs should include private as well as commercial vehicles, and that emissions should be looked at per passenger as opposed to per vehicle. What are the views of panel members, including Mr McNally, on private vehicles being subject to LEZs?

Dr Hamilton: That is a very pertinent question. The reason why we are here today is that we have a measured problem with air quality in our cities and towns. I am 100 per cent sure that most of that problem has arisen from there being too much diesel in the car fleet, in the wrong place, at the wrong time, in the wrong technology. Although the aims of the CAFS strategy are admirable, there is a fundamental problem in how we fuel our private vehicles in the UK. To be blunt: if there was no diesel, there would be no problem.

As I said, I have done a lot of work overseas in countries that have similar concentrations of NO₂ to Scotland but very much higher PM₁₀ concentrations. That is because they do not use

diesel. If we could reverse the dieselisation process that began 15 years ago, or whenever it was, our air quality problems would go away almost overnight.

Vincent McNally: On the cars issue, I say yes. A committee paper that was passed in Glasgow stated that cars will be included in subsequent phases of the low-emission zone.

I echo Scott Hamilton's comments on the dieselisation of the fleet. That is the reason why we have the problem at the moment. There are still tax incentives to drive diesel cars, and vehicle MOT tests do not test for NOx emissions. The diesel fleet has big problems that will not go away overnight.

David Stewart: My final point is more of an observation than a question. Confidence has not been helped by the difference between ideal lab conditions for diesel vehicles and the on-the-road reality. Mr McNally made that point in another context. There have been companies that have falsified results, which has hit confidence. I note that diesel vehicle private car sales have plummeted in Scotland, so individual drivers are clearly taking the issue on board. Does the panel have any general points on the difference between lab conditions and real life?

Dr Hamilton: My observation on diesel engines is that manufacturers have a difficult technological challenge to get to the emission levels that are being promised for the subsequent iterations of the Euro 6 vehicle standard—C and D—that are due to come in over the next few years. There is confidence that the testing regime has been tightened up to include real-world driving conditions, but it is a tough task. If we get to Euro 6 C and D and we still have an issue, we will have to use less diesel. The choice is not Euro 6 diesel or Euro 5 diesel, it is less diesel—full stop. Even a brand new diesel car will emit probably 10 or 15 times more NOx than a brand new petrol car. Going back to first principles will solve the issue overnight.

John Scott: This is probably a daft laddie question, but can one retrofit diesel cars? You have talked about retrofitting buses. Is it not economically viable for cars?

Vincent McNally: It is not economically viable to retrofit cars. The cost of retrofitting a bus is about £15,000, and the technology takes up a lot of space. In a bus chassis and engine compartments, there is a lot more space than there is in cars. It is just not doable for cars or for smaller vans.

The Convener: It is good to clarify that. I will move us on and ask the panel a combined question. Do you support congestion or other direct charging to discourage driving into or within

urban areas? Let us also look at the uptake of electric vehicles and the development of charging infrastructure. Would you be in favour of a requirement for all new build to have an electric vehicle charging point?

David Duffy: My answer will probably not be as scientific as those of the other gents. We would support any measure that would improve public health, such as congestion charging, as part of a risk-based strategy to reduce congestion. However, we would not see that as the first point of action, because it would have other impacts.

On the second point, we greatly support making electric vehicle infrastructure more available in order to encourage use of the vehicles.

Dr Hamilton: On congestion charging, I am not a politician or a transport engineer, so I can only speak to the environmental benefits. If we think of a city as a big box, essentially, we can say that the lower the emissions in that box, the less exposure to high concentrations of pollution there will be. Congestion charging would probably reduce emissions in that box so I would definitely support it.

On electric vehicle infrastructure, I live on the third floor of a tenement building in Glasgow, and I cannot get an electric vehicle because I would not be able to charge it. There are challenges in cities such as Glasgow where a lot of people live up high. I would buy one tomorrow if I could make it work, so any more infrastructure would be a good thing.

Vincent McNally: Work is being done in Glasgow at the moment. As you can imagine, we have a lot of tenement properties, and putting in that charging network is a challenge. However, new and innovative work is being done on how we can do that. It is always a struggle to encourage developers to put in charging points in new developments, perhaps because they do not see there being the demand that we do. Our view is that, if you build infrastructure, people are more likely to use it in the future, so more charging points are definitely a good thing.

Congestion charging can become a political issue, but I will speak from a personal point of view. I believe that there is no desire at national Government or local government level to introduce road-user charging, but anything that cuts down on congestion will have a positive impact on air quality.

Mark Ruskell: I have a brief follow-up question on David Stewart's point about cars. How significant are cars as a component of air pollution in our cities? Is the issue more to do with the fact that cars create congestion, which means that freight vehicles and buses are stationary and are therefore producing more emissions? I am trying

to get a sense of where cars sit within the overall problem that we have and what contribution they are making to the problem.

Vincent McNally: The work that we are doing on low-emission zones has provided quite a lot of modelling data. The situation varies from street to street. On streets such as Great Western Road, cars contribute 70 per cent of the levels of air pollution that we are recording, while, on streets such as Hope Street, that same level of air pollution is caused by buses. The level depends on the type of traffic and how it is moving in any given area. An interesting feature is that, in Great Western Road, although cars are the main source of pollution, the objective is being met.

There is a mixed picture. In the city centre, there are some streets in which half the air pollution is produced by cars and half is produced by buses. However, what is important is that, on the car side, 90 per cent of the emissions are being produced by diesel vehicles. I would be happy to send you some data that is broken down by the different types of fleet: buses, taxis, heavy goods vehicles, vans, diesel cars and petrol cars. It shows that diesel cars and buses are the main issues in Glasgow.

Dr Hamilton: All UK authorities have been considering this problem since 1997 and have been tasked through the local air quality management legislation to conduct what is called source apportionment. Every local authority in the country that has an AQMA will have gone through the process of apportioning the relative importance of sources to inform local action planning.

There is a huge amount of evidence already, outside of the CAFS scheme. All councils will probably have source apportionment data. I echo Vincent McNally's point about diesel cars and heavy traffic.

11:15

The Convener: David Duffy is next.

David Duffy: Scott Hamilton just said what I was going to say.

The Convener: Excellent—thank you.

Mark Ruskell can ask a brief supplementary.

Mark Ruskell: I was going to move on to another topic.

The Convener: Okay—I will allow Emma Harper back in.

Emma Harper: We have not talked about Brexit yet. What impact, if any, will Brexit have on air quality in Scotland?

Professor Sutton: The revision of the national emission ceilings directive, which was agreed in

December 2016, involved a major negotiation to take forward the previous international commitments on our national UK-level emissions and those in the rest of Europe. One could ask where that would stand in a post-Brexit world. Among other things, the revised directive committed the UK and other countries to further reductions of sulphur dioxide and nitrogen oxides from industry and transport and of ammonia from agriculture. Perhaps those commitments will not exist in the future, but I am not certain.

The directive had a specific annex about national plans on taking action to reduce agricultural ammonia emissions. That annex was not in the 1999 directive, so it was a new commitment, and it may or may not go ahead in a post-Brexit world. We have heard a lot today about city-level pollution, particularly from nitrogen oxides, and a large source of that is cars and industry. The ammonia that contributes to the particulate matter from agriculture creates a higher level of background PM that comes into our cities and makes PM levels even worse.

We have the European legislation, together with the approach of the United Nations Economic Commission for Europe, although that is not as strong as the European one. Without the European legislation, UK legislation would be lacking and something else would need to be put into place.

Dr Hamilton: If we can retain control of the ambient standards that we have now and the emission sources, there is no reason for Brexit to affect us at all, in the sense that concentrations will not change or will continue to improve. The standards tend to come from Europe although, admirably, the Scottish Government has adopted even more stringent targets. If control of that is lost through the process, our benchmarks will suffer and maybe inevitably that will result in a deterioration of air quality. If we can control the emissions and the standards, there is no reason to suspect that Brexit will make things worse, but we do not know.

Mark Ruskell: I want to go back to air quality management areas. We have seen a trend in Scotland of increasing designation of AQMAs. Is that a good or bad thing?

Dr Hamilton: One of the long-standing problems—I use that word although I do not know whether it is a problem—is that there is no real compulsion on local authorities to adopt a consistent approach in declaring AQMAs. One local authority might choose to declare its entire area as an AQMA, when actually it might have only two or three hot spots, whereas other authorities might choose to create an AQMA that is almost like a ribbon that follows a road. I do not really know the pros and cons of those

approaches, but I would not always associate an increase in prevalence of AQMAs with a deterioration in air quality. It takes time for local authorities to investigate all the potential problems in their areas, so the development of AQMAs might be a manifestation of authorities getting round to looking at areas over the passage of time. It is not necessarily indicative of worsening overall air quality.

Vincent McNally: I would just make the point that in Glasgow we have just revoked our city-wide air quality management area because the air quality targets are being met. We are looking to revoke our Parkhead Cross air quality management area if the figures for 2017, when they are completed, show that the air there continues to meet the objective for NO₂. Therefore, we are going in the opposite direction and reducing the number of air quality management areas because of improving air quality.

I do not want to comment on other local authorities too much, other than to say that there is now more and better air quality monitoring equipment that can assist local authorities in identifying problem areas that they were not aware of previously.

David Duffy: I echo some of what Vincent McNally and Scott Hamilton said, in that the knowledge and awareness that is needed to identify problems might not have been embedded among all the local authority and environmental health professionals. Air quality is also not high on the agenda of some local authorities; in a way, awareness of it is greater in the community.

The infrastructure is miles better than it was in terms of monitoring. I would not necessarily say that things are not worse, but we are better informed now of where problem sites might be. Identification of hot spots or problem areas is better—we probably were not aware of them in the past. We have scientific back-up to say that they exist, partly because of the extension on the monitoring side, but also because of the experiences of other authorities and professionals who are looking at them.

Mark Ruskell: Mr McNally, where an air quality management area has been revoked, what package of investment or measures were put in place? Are councils adequately funded for that?

Vincent McNally: It will always be possible to find a way to invest any additional funding in improving air quality.

It has to be noted that generally across Scotland, levels of pollution have been reducing. Although there is still an issue with diesel vehicles, they are cleaner now than they used to be. Certain areas have less vehicle use, more public transport

use and more people cycling and walking than they used to. A broad range of measures have been introduced. I like to think that our air quality action plans have contributed to the reduction in pollution that has allowed us to revoke the air quality management areas.

However, the more investment there is in sustainable and public transport, the better air quality will become and the more air pollution levels will reduce.

Professor Sutton: I will make just a quick comment. We should not forget the European industrial emissions directive, which was previously known as the integrated pollution prevention and control directive, which deals with large installations. That covers anything industry-like—including very large pig and poultry farms. The implications of the industrial emissions directive are very busily looked after by SEPA, and I am not aware of any national legislation that is currently in existence that would do the same job.

Mark Ruskell: We can move on. Mark Sutton mentioned in his written submission a need for

“a step change in the level of communications”

about air quality. Can you expand on that? What would that entail?

Professor Sutton: That evidence was written by my colleague Stefan Reis, so I am trying to think what you are reading into his text.

Mark Ruskell: Perhaps it refers to public communication and how stakeholders can be involved in tackling air quality issues, or become more aware of them.

Professor Sutton: Stefan Reis might have been making the point that there is a need to communicate across boundaries. One thing that we have not yet heard much about is the ecosystem impacts of air pollution. We have talked a lot about human health impacts.

In his evidence, Dr Reis drew in, for example, the impacts of tropospheric ozone pollution, which is caused when nitrogen oxides come out of cars and industry and come together with volatile organic compounds, which produces ozone in the air that we breathe. That leads to about a 5 per cent loss of yield in many crops across the UK, so it has agricultural consequences. That is an example of something that does not have a strong place in the current narrative about air pollution, which is dominated by the effects on human health in cities. He was drawing attention to the fact that there are multiple other benefits that we should be thinking of.

Of course, air pollution impacts also on semi-natural ecosystems. Scottish Natural Heritage is charged with protecting nature reserves across

Scotland that are currently designated as special areas of conservation or sites of special scientific interest. Many of those are impacted by the same air pollution that affects human health. We have crops, nature and ecosystems; perhaps Dr Reis wants to encourage us towards an holistic ecosystem health perspective that joins those all together. A higher level of awareness of the connections is needed.

Mark Ruskell: I understand that issue. Another issue is whether the right public information about air quality is available through health services and education institutions in our cities and towns. Would anybody like to comment on what a step change in communications might look like, particularly as we roll out local low emissions zones?

Dr Hamilton: I am not a communications specialist, but many of the successes that we are experiencing relate to education in schools. Perhaps pollution could become a large component of school curricula. The trouble with a direct method of communication about, say, air quality conditions in a city is that the measurements that lead to that are subject to some uncertainty. It is technically difficult to give a reliable picture of the air quality conditions on a street at any given moment.

Mark Ruskell: What about public advice?

Dr Hamilton: Public advice not to buy diesel cars would be a fantastic start. I keep coming back to diesel but, unfortunately, it is the elephant in the room. The trouble with advice is how it is framed. Many problems relating to vehicles are not the fault of the people who bought them; they are the fault of an engine that is not doing what it is supposed to do in the real world. That cuts across enforcement and education. What should someone who gets an enforcement notice for a car that they thought was clean do? It is a difficult challenge.

The Convener: That goes to the nub of the matter, which is a trust issue. I am a diesel vehicle driver. I bought one, as did many others, because I was told that it was better for the environment. The same people are telling a different story now, so Dr Hamilton will understand why the public are sceptical about the essential advice that we need to give them.

Dr Hamilton: Dieselisation was the result of a drive to reduce carbon emissions. Diesel is demonstrably less carbon intensive, but it is also demonstrably more toxic. I guess that that is a question for the policymakers, because there is no doubt about that conflict: it is what it is.

Richard Lyle (Uddingston and Bellshill) (SNP): We have just discovered the magic bullet: bring in a law to stop people buying diesel cars

and go back to petrol. Petrol was lead-based a number of years ago and people moved from petrol cars. I, too, am a diesel vehicle driver. Have you not discovered that we should go back to petrol cars and do away with all this pollution that affects carbon levels?

Dr Hamilton: We are going into the realms of fantasy, but if there was no such thing as diesel cars, we would have no NO₂ compliance issues at all. We do not have compliance issues with PM₁₀ anymore. It would be a similar picture to lead, which was taken out of fuel overnight and ambient concentrations of lead dropped instantly. The same would happen with the removal of diesel from the private car fleet and light goods vehicle fleet.

Richard Lyle: Could every vehicle be changed to petrol?

Dr Hamilton: It could be done to vehicles in which that is viable technologically. It would not be viable for heavy goods vehicles or buses, but it certainly would be for light goods vehicles and cars.

Vincent McNally: It would not work for heavy goods vehicles or buses, but they could be converted to the Euro 6 engine, which does work in the real world. If we moved to cars being petrol or, even better, electric, there would be a significant reduction in pollution. The new one litre turbo-charged petrol engines are very efficient. They deliver huge amounts of miles per gallon, so there is definitely an argument that people who do higher mileages should switch to them.

It is said that diesel is better for carbon reduction, but the evidence shows that people who buy diesel cars tend to drive more miles in them, because they get more miles to the gallon. They buy heavier four-wheel drive vehicles that are less efficient. I do not want to get into the realms of conspiracy or how big industry works, but you can sell more expensive—and more profitable—vehicles if you put diesel engines in them. If you put petrol engines in them, the fuel consumption would be eye-watering. A lot of people around this table will have bought diesel cars for the right environmental reasons, but a lot of people bought them purely for economic reasons—they were thinking of financial self-interest. That has to be addressed if we are going to get people to move away from diesel vehicles.

The Convener: Absolutely.

11:30

Claudia Beamish: We have touched on resources and the importance of funding. Are there the appropriate and necessary skills in local authorities, and in public bodies more widely, to

address the issues that we are talking about today? If not, how can they best be developed?

David Duffy: REHIS can only really speak about environmental health officers and folk who are affiliated to the environmental health profession, and there has been a reduction in the number of them coming through. There have been discussions with members of the Scottish Parliament about how we might tackle that. Local authorities are employing fewer such professionals. In local authorities and other enforcement agencies, we are all subject to the impact of financial constraints. REHIS has attempted to adapt to the situation and to provide a route for professionals to work in the area.

Historically, environmental health professionals have led in air quality management, but they also work in other specialisms. Environmental health officers, or technical officers, do not deal exclusively with air quality—there is food, health and safety, noise and other subjects. However, talks are on-going about how we can try to encourage more professionals to come forward, and REHIS will help in any way that it can.

Claudia Beamish: Are there any other quick comments on skills?

Professor Sutton: I want to talk about skills among farmers, because farmers are losing nitrogen from their farms—as I mentioned, it is going up into the air and contributing to greenhouse gases, air pollution and water pollution. In air pollution, the dominant issue is still ammonia. Concerns have also been raised about nitrogen oxides coming out of soils—the same stuff that comes out of exhausts. It is a small fraction, historically, when compared with car exhausts and factories, but if we make progress with those other sources and do not address the nitrogen oxides coming out of farming, it will become an increasing share. We have estimated that, by 2030, 10 to 20 per cent of nitrogen oxides in Europe could be coming from farming soils.

That points to education for farmers, many of whom are educated in how to make their businesses run but not necessarily in the nuances of how to reduce air pollution. There is a case for better information on the technologies that might help farmers to reduce pollution and, at the same time, to save some money. Where they might need to invest in equipment, information could give them confidence that it will pay off in due course.

John Scott: I declare an interest as a farmer, with a vested interest in that regard, as farmers are always interested in ways of saving money given the current viability of food production in this country. You might want to develop that point about the potential for saving money.

The question that I had intended to ask before my thinking was hijacked was about the agricultural machinery that is used for food production. I am thinking of self-propelled vehicles such as tractors. Will they continue to be diesels, or is there a new developmental phase for agricultural machinery?

Professor Sutton: I do not think that I have the competence to answer that question but, given that all sorts of vehicles will be electric in the future, I imagine that that will be possible with some agricultural vehicles. The issue will come down to the power requirements for a particular task.

It is clear that precision agriculture offers great potential. If we make savings through the use of fertilisers and manures that generate fewer emissions, that will mean more precise input of a smaller amount of mineral fertilisers. There will be a big difference between the amount of power that is needed for a fertiliser application and the amount that is needed to plough a field, so we might end up in a world in which farmers need two pieces of kit. They might still need a diesel for doing heavy work, but they might also be able to use a lighter piece of kit that is electrically powered.

Vincent McNally: I do not think that we will have a replacement for diesel tractors any time soon. That is not the issue. Those vehicles operate in areas where we do not have air quality concerns. It is the vehicles in our built-up urban environments that are causing the air quality issues.

With regard to the previous question about the skill set, the Scottish Government has provided training courses for local authority officers on local air quality management, air quality assessments and so on. There has been some investment in that area.

In addition, SEPA has shared resources with the local authorities in Glasgow, Dundee, Aberdeen and Edinburgh in order to make progress on low-emission zones. It has been great for a local authority such as ours to get that level of engagement with the senior scientists in SEPA.

Dr Hamilton: I want to go back to the question about education. I have a strong involvement with a university in Glasgow. Through that link, I supervise PhD students. I make the observation that atmospheric science—and, by extension, air quality—is a fantastically complex field. At the moment, Scotland lacks university education programmes in atmospheric science, combustion science and first-principles science with specific relevance to air quality. For example, I could not do a masters in atmospheric science in Scotland—I would have to leave the country to do that.

Professor Sutton: I want to offer a caveat to Vincent McNally's comment about emissions in rural areas. It is very important that we distinguish between the different pollutants and the different impacts. If we are talking about a direct emission from an exhaust pipe contributing to NO₂ or particulate matter, there will be less impact from a tractor that is out in the field, away from people. That is fine. However, if we are talking about the nitrogen oxides that come out of the back of that tractor and contribute to secondary particulate matter, along with all the other emissions that occur in the rural environment, those rural emissions will blow into the city and result in a much higher baseline level of air pollution, to which the local sources of pollution will add. Therefore, it would be wrong to say that an emission in a rural environment does not contribute to urban air pollution threats, but we need to distinguish between the primary and the secondary pollution issues.

The Convener: Thank you for that.

Richard Lyle: I want to pick up on a comment that Vincent McNally made earlier. We have been told in oral evidence that there are only 95 air quality monitors across Scotland, but Vincent McNally said that Glasgow City Council has more than 100. I take it that we are talking about two separate types of monitor.

Vincent McNally: We have more than 100 monitoring locations in Glasgow. I think that we have 12 fully automatic monitoring stations, which are linked to the Scottish air quality website. That means that it is possible to get live data from them. They give us fantastic minute-by-minute data on levels of pollution in specific areas. However, there are only 12 of them, so we supplement them with a network of diffusion tubes, which are an accepted way of measuring the annual mean for NO₂. There are approximately 100 of them at various locations in Glasgow, and we constantly monitor where they are to see whether they need to be moved to a better location. If years of data have shown that the levels of pollution in a location are particularly low, we can relocate the equipment to somewhere that is more appropriate. That is all included in our annual progress report and our reporting to the Scottish Government on our air quality levels in the city.

Richard Lyle: Do the panel believe that existing monitoring stations are in the right places and are collecting the right data to provide a broad picture of air quality across Scotland? Should we have more monitors such as those in Glasgow—I am pleased that we have them—and have broader coverage across Scotland?

Dr Hamilton: As an air quality scientist, I much prefer to work with measurements from an

automatic station that is subject to European standards of quality assurance and quality control. The measurements are much more reliable and they offer temporal information across the day that we do not get from passive measurement techniques such as those that Vincent McNally mentioned.

We rely too much—not just in Scotland but in the UK—on passive long-term averages from diffusion tubes. The uncertainty in each of those measurements is about plus or minus 20 per cent, and that is the best case. When we have an exceedance of 2 micrograms, which is less than 5 per cent of an exceedance against the standard, and there is uncertainty in the measurement of plus or minus 20 per cent, that is not good enough, in my view, yet that is set out in the UK and Scottish Governments' technical guidance as being an appropriate way to measure NO₂. We should undoubtedly have more automatic stations.

The Convener: It seems that no one else wants to comment on that. Mr Lyle, do you have any further questions?

Richard Lyle: We agreed earlier about the importance of educating the public, including drivers, on air quality. Should we have more visible air quality information next to monitoring systems? We have signs that tell people to slow down to 30mph because they are driving too fast. If I am walking past an air quality monitoring station, should I be able to see a sign that gives information on the air quality level, rather than having to plug in somewhere and download it?

Vincent McNally: We looked into the internet of things and considered whether we should make the information available to people in that way. There are a couple of issues. First, the minute-by-minute data is unratified and it needs to go through the system before we can report it with any degree of confidence. Secondly, we would need to add new equipment to the stations and it would need to be maintained, so there would obviously be a cost to that.

The information is already available. Most people have smartphones and they can easily connect to the Scottish air quality website. Wherever they are, they can drill down into the data for their area. They can look at the nearest monitoring station and pull up the data from that. They can also set up on the website to get emails as often as they like. Because I am sad, I get one at 8 o'clock every morning that tells me the data at every automatic monitoring station in Glasgow in the previous 24 hours. It also gives a prediction or forecast of the pollution levels that day.

People who have health concerns can register with the Scottish air quality website's know and respond service, which will send them texts. That

service can tell people who have underlying health conditions whether they are likely to experience high levels of pollution so that they can avoid that by staying indoors or even just cut down on any strenuous activity.

We are fortunate that the levels of pollution that we experience in Scotland are generally low all year round. We do not have many episodes where pollution levels are high.

The data is there and people can access it. There probably are things that could be done better. In the past, we have looked at putting quick response badges on the side of stations. People would be able to scan those with their phones and they would automatically be let in, just to make it a bit easier. That has not been followed through on but, when it comes to engaging with the public, we probably could look at ways to make it simpler for people to find the data in their areas.

11:45

Richard Lyle: Do you agree that the level of detail in the CAFS annual report is adequate to enable us to scrutinise progress in what we do?

Vincent McNally: I think so. CAFS has been a positive development in the air quality work that is done in Scotland. If people want to read the information that is in the annual report, it will give them a good update on what is happening throughout Scotland.

Finlay Carson (Galloway and West Dumfries) (Con): My question is about not only the number of monitors but the use of data. There is always an argument that we could have a lot more monitors of certain types, but do we not have the data available from MOTs and specifications on what cars' emissions are likely to be at different speeds? We have weather reports that tell us what the condensation levels, humidity and wind direction will be. We have monitors on the road that record car speeds and vehicle lengths. There is also an increased use of automatic number-plate recognition software, so we know what vehicles are moving down Hope Street or up whatever street. Is there not scope to use more modelling to provide real-time estimates of air pollution? Is that not the way forward?

We are considering low-emission zones; how much joined-up thinking is there about digital cities, which involve using number-plate recognition for traffic management and billing or parking? Is there any joined-up approach to using big data for everybody's benefit? If so, who should lead that?

Dr Hamilton: I will summarise your first question as being whether there is enough data? Undoubtedly, there is enough data right now for

us. We know the problems and where they are, but we just do not seem to be able to fix them. Although there is an attraction to having more measurements, that would not delineate the problem any better than it is already delineated. More measuring stations might help with public engagement and delimiting the scope of the problems, but we already know the problems and we should just get to work trying to fix them.

What was the second point?

Finlay Carson: If there is a lot of data available, should everybody get together and compile it? We talk about digital cities, where the data is all available. Is that being done? There are lots of different sectors so, if it is not being done, who should lead it?

Dr Hamilton: It is reasonably straightforward to produce real-time models of pollution in cities. The organisation that I work for does it. We do it more overseas than here, admittedly, but there is no reason why that could not be adopted in Scotland.

There is already an air quality forecast in the United Kingdom. My company used to run that programme on behalf of DEFRA and the Scottish Government, but it is now done by the Met Office. Each day, you can get a forecast of air pollution. It is at very low resolution, so it will be the same prediction in Glasgow as in Hamilton, for example. The technology exists. It is just a matter of application.

Professor Sutton: I will make two points. I should declare an interest in the first one, which is about rural monitoring. CEH runs the only intensive rural air pollution monitoring site in Scotland. In fact, we are paired in a network with Ricardo-AEA, which runs the single site in England, which is down at Harwell. Compared with the amount of monitoring that is done of the urban environment, that is relatively modest.

I would like to be able to say off the top of my head what percentage of our urban particulate matter comes from rural sources advected in, but I cannot remember it. Is it 60 per cent or 70 per cent? It is a substantial fraction. Knowing how much is coming from the rural environment into the urban environment tells you how much you should concentrate on your rural sources as well as your urban ones. That is an important information source and we are happy that those two sites—one in Scotland—already exist.

John Scott: As you are talking about baseline figures, how much pollution is in the air as it comes across the Atlantic, if we take the prevailing wind as being south-westerly? You talked about baseline figures and pollution going from agriculture in rural areas into the city, but how much baseline pollution is in the air from the Atlantic?

Professor Sutton: It depends on the pollutant form. Ammonia has a short lifetime, nitrogen oxide has a longer lifetime and particulate matter has a long lifetime. Those lifetimes mean that there are typical transport distances of up to 1,000 or 2,000km, which means that there is substantial air pollution transport within Europe but, broadly speaking, the air pollution from North America has been washed out before it gets to us. Therefore, there is not too much of a problem from North America but a substantial problem from Europe, when the wind is in the right direction.

My second point is on public communication, in which I have no interest other than being a citizen. When I went into Delhi in India, I saw a big billboard on the side of the road that told me the air quality level. I sat there in my taxi thinking how interesting it was that Delhi has that information up in lights on billboards in several places. Delhi has the SAFAR system—system of air quality and weather forecasting and research—should you want to go online to look that up. It is an interesting way to raise awareness, and I suspect that they get rather more visits to their website in Delhi as a result of having those billboards.

Dr Hamilton: I want to make a point about wind direction. We are very lucky where we are as, most of the time, we benefit from clean Atlantic air. It is clean in the sense that it does not have a lot of NO_x, NO₂ or particles in it, and the particles that are in it are typically from sea salt or other natural sources.

Vincent McNally: There are more and more sources of data becoming available all the time. I do not know who would be best placed to lead on that. Some types of data are more useful than others; the MOT data, for example, is not really useful, because the MOT does not test for the right things. Diesel vehicles are tested only for smoke opacity, which is a very crude test for the amount of black smoke that comes out of the back of the vehicle, and they are not tested at all for NO₂ so we get no feedback on that.

Various pieces of technology have come on to the market that allow for real-time emissions testing without having to pull vehicles over; basically, it scans the plume that comes out of the back of the vehicle and reports on it. It is still to be figured out how that will feed into the system and how we will use that.

There are other data sources such as monitoring Bluetooth for travel times across the city. That can feed into looking in real time at ways of better resolving traffic congestion, which will have an impact on air quality. I do not know whether it is being looked at UK-wide or Scotland-wide, but it is being considered as part of the work to fully model the air quality impacts within cities.

John Scott: What work has CEH done to map and assess the impact of nitrogen emissions on air quality in Scotland and, if you have done that work, what were the results? You might have answered that in part, but there is a point to my series of questions.

Professor Sutton: That work has primarily been focused on a United Kingdom scale, and is under the lead of DEFRA with the devolved Administrations contributing to it.

The first step is working out what the emissions are and mapping them. We work together with Ricardo-AEA; we take particular responsibility for mapping agricultural emissions and Ricardo-AEA takes responsibility for traffic sources, for example, and we share various other sources.

In agriculture, the first step is to know where the sources are. We start with livestock census data at a parish level and, with various land cover techniques, model that to get it into a gridded form. Those inventories give us how much air pollution is coming out around Scotland. We have many of the sources at 1km grid resolution. We know what emissions are going up into the atmosphere, and we then use atmospheric transport models to see what happens when they blow around and come back down. That simulates the air concentrations and the total amounts coming back down again as a deposition. Those are the kind of tools that we use.

I mentioned the air quality monitoring, which provides validation data. The intensive site, which is at Auchencorth near Penicuik, which is a rural site, gives data that we can use to test the validity of the models. We have a clear view of what is going up and coming down. Of course, there are necessarily uncertainties, and we have some understanding of those uncertainties.

John Scott: Does Dr Hamilton want to say anything about Ricardo's contribution to that monitoring?

Dr Hamilton: I am not specifically involved in that project, so it would probably be best to leave that to colleagues.

John Scott: My next question is again for Mark Sutton. What policy gaps might there be? Is there a way in which policy could be enhanced? Given your wide knowledge of the issue, I am not asking only about agriculture.

Professor Sutton: I will look at the bigger scale rather than the city scale on that. I mentioned the United Nations Economic Commission for Europe, in which I have contributed to discussions and which signed a revision of the Gothenburg protocol, and the revision of the national emission ceilings directive, which followed that two years ago. The countries have made greater steps

forward on reducing sulphur dioxide, to the extent that sulphur dioxide emissions are now tiny by comparison. Indeed, farmers often now need to apply sulphur fertiliser, but that is okay because it means that sulphur is not depositing on forests and we have largely got rid of the acid rain problem, which was the reason for doing that.

On nitrogen oxides, again the countries have committed to substantial further reductions. The way in which that is achieved is of course up to the national plans, but progress is being made, particularly on industrial sources.

I keep coming back to agriculture, but I have to, because the commitments that the countries have made on it have been very modest by comparison. That is of course a social debate, particularly when there is a subsidised industry that is doing its best to make ends meet. However, quantitatively, there is much less ambition on agriculture.

I cannot say what the right way forward is, because I see that a world with tough regulation can be rather divisive and it means that people get stuck in the mud not wanting to do something and, conversely, a world with incentives in which we say, "Let's all work together," can be more constructive. The UK is committed to a reduction in ammonia emissions of something like 8 per cent by 2030, whereas the Netherlands achieved a 50 per cent reduction between 1993 and the present, so some countries have shown that, where they are willing, they can do things.

The feedback that I get from many stakeholders is that, if that was done here, they would be bankrupted, but the interesting thing is that the Dutch farmers are, mysteriously, still in business somehow. There is something much smarter going on that we have not thought about in the discussion on whether there should be regulation or a voluntary approach. There is a question about how to gradually nudge forward, through education, towards smarter approaches that we would not otherwise have thought about. I cannot say whether regulation is right, but we somehow have to be smarter so that people can see that there are opportunities, bearing in mind that much less has been done in the agriculture sector than in the car and industrial sectors.

John Scott: Who would have the role of using nudge theory? Most farmers would be up for cost savings and doing things better. Farmers are very much involved in food production, which is important for food security issues and for feeding our nation. Can you say a little more about the situation in the Netherlands? What were the key barriers to development and implementation of that improved policy, which you say is better than the one that we have here?

Professor Sutton: The Dutch have certainly gone a lot further. Around 1993, the Netherlands said that all manure was to be spread into the soil rather than on the surface—it committed to deep injection of manure into the soil. That was also done in Denmark, but not all the farmers wanted to inject. As things developed, other people said that they would do a combination that involved acidifying their slurry and a surface application in a trailing hose. That means that the stuff goes out in nice, neat rows. Therefore, there is the philosophy of precision farming in getting the stuff down nice and evenly, but the energy is not needed to get it into the soil.

12:00

Those two policies on how to spread muck are at the heart of what has been achieved in the Netherlands and Denmark. That is where the big achievement has been. Good manure storage has been added to that; there is no open manure storage at all, and they have committed to that. Of course, it comes down to how the system is designed. It will be much harder to cover an open lagoon than a tank-based system.

To me, there will be a long-term development as equipment turns over. That applies to the housing systems, too. Low-emission animal houses tend to be the most expensive things to do. The Netherlands and Denmark have committed to those, as well, so people there will not operate a pig farm without scrubbing the air that comes out of the back of it. If someone is going to rebuild their building in due course, they should ensure that they do so with the latest technology.

Denmark and the Netherlands have gone to extreme lengths, and I do not know whether that is right or wrong; I am just reporting it. It is interesting that some farmers decided that they did not want to run the scrubbers on their buildings. In the game of cat and mouse, the Government came in and installed smart meters on the animal houses so that it knows whether the scrubbers are being turned on. I do not know whether that is good or bad, but it certainly means that farmers will be more diligent in extremis in reducing emissions.

Let us make a comparison. The first thing to realise is that there is a chain. I would work back from the farmer's perspective, which is, "This is manure. I want to use it well. I'll start in the field and I want to get the best out of it. Does that mean that I'll have to buy some kit?" Maybe they are not a big enough farmer, and they will want to share equipment or even use contractors. Having made the best out of the muck that they have, they will want the best-quality muck that they can get, which means that it will not be diluted with a mass of water and will not have lost half of its goodness

to the air. The question is whether they can have that in a store.

I have a friend who runs a very large farm. They invested in a low-emission manure spreader—a shallow injection system—and then in slurry bags. They are massive pillows the size of the table that we are sitting at, into which slurry is put, so it has zero emissions. My friend noticed that the quality of the manure that came out of the slurry bags was better than its quality when it went into them, because it mobilised more inorganic nitrogen, and they got it into the hole better. They have found out that they get a greener crop, and they are saving several tens of thousands of pounds a year on their fertiliser bill as a result.

In the end, that points towards a world in which we might look to training for farmers on how they can put into their business plans that they have to invest in something. They would ultimately want payback time on that investment. It could pay for itself in due course and give them confidence in knowing that that can happen.

I cannot answer the question about ambition levels. It is a bit like Mark Ruskell's question about how many deaths as a result of particulate matter and air pollution shortening lives are acceptable. It comes down to the level of ambition that we want and how far we want to get. That has to be a policy question. Surely much can be done to mobilise people through incentive schemes and better education to take up those measures so that leading farmers use them and others see their friends using them and think that they might use them, too. Ultimately, if we really want to clean the air by 50 per cent in a few years, I cannot see any other way than by regulation. However, that is a social discussion.

John Scott: My final question is for everybody to answer. Who should be responsible for developing and implementing a nitrogen strategy in Scotland?

The Convener: Briefly.

Professor Sutton: As I mentioned, nitrogen is going up into air pollution, contributing to our greenhouse gas emissions through nitrous oxide, and contributing to water pollution. I can imagine the Scottish Government convening lots of stakeholders, including SEPA, academia and farmers, to ask what the evidence is and how we can do things together. Last week, I was in a meeting convened by Nourish Scotland with many of the stakeholders, and they are very keen to see this in a future climate change revision that you are looking at.

Everybody needs to be on board, but somebody needs to hold the handle; I guess that that will be the Scottish Government.

The Convener: Does anyone want to add to that? Do you agree with those comments?

I see heads being nodded. Thank you.

The final set of questions is from Angus MacDonald.

Angus MacDonald: Coming from a farming background, I found that fascinating. However, I want to look briefly at development planning issues and the need for new housing.

Air quality is not always considered to be a priority when it comes to development planning and transport planning. Do the witnesses see any way of reconciling the need for new housing and related services with the rise in motorised travel?

Vincent McNally: I am not sure that I fully understand what you are asking.

Angus MacDonald: There is an issue around development sections in various local authorities perhaps not taking air quality as their priority. Is there any way of making sure that they do that? New housing obviously attracts an increase in the amount of motorised travel. Would the increased use of electric vehicles be a solution or would that not go far enough?

Vincent McNally: That is certainly a consideration as part of the planning process in Glasgow. We look at developments and, if necessary, require that a full air quality assessment is carried out to support the submission through the planning process. We scrutinise the submission and see whether the development is likely to have any impact on air quality. If there is any negative impact, we look for mitigation measures to be put in place to reduce the impact as much as possible.

Placemaking is a key component of CAFS planning. I am not a planning officer but decisions are being made on how we develop the city, and whether there is adequate provision for sustainable transport, transport planning, public transport provision and electric charging points if and where necessary.

Some developments that are taking place at the moment have had no parking provision granted at all, because it is recognised that we do not want to encourage people to bring additional vehicles into the city centre.

Air quality is further up the planning agenda than it ever has been.

The Convener: You have obviously given a lot of thought to this. What are the solutions to providing charging points in a city such as Glasgow that has so many tenement buildings?

Vincent McNally: It is a challenge. One solution could be localised hubs. Will we need as

many petrol stations as we go forward? A lot of petrol stations have been taken out of the city centre area, so that could be a way of doing it.

We are currently looking at the ruggedised project in Glasgow, which is looking into tapping into street lights instead of putting in brand new charging points. The technology will lead the way to what can be available as the market grows. We are seeing quite significant growth in electric vehicles, so the technology should make available a variety of new and innovative ways of charging vehicles in built-up areas.

We already have charging points in our multistorey car parks, and their number could be increased. Charging points have been installed at shopping centres and supermarkets and so on, and the numbers could be increased there, too.

Of course, as battery technology improves and the mileage increases, people might not need to charge their vehicles every day. We will have to wait and see, but these things are certainly being considered. It is a challenge for Glasgow, but it is being looked at.

David Duffy: I echo what Vincent McNally said. That is the experience across the rest of Scotland.

The Scottish Government is training planners in air quality and that is helping to inform them so that they consider air quality more. That also informs anybody who contributes to housing strategy within local authorities. The increased prominence of air quality on the agenda also informs local development plans.

As Vincent McNally said, there are guidelines about where thresholds would be breached in respect of housing size. If there was a major new development, it would trigger consideration of the impact. Planners, in my experience through the networks and pollution groups, are becoming increasingly aware that they can secure agreement by providing for better walkways and access routes, and monitoring before and after, not just for housing projects but for commercial settings where there are large-scale developments. That is further up the agenda in development control and housing developments. Hopefully, that will improve as housing demand is met.

Angus MacDonald: Should the provision of an EV charger on every driveway be a condition of any planning application that is granted for houses, as opposed to flats?

Vincent McNally: It depends on the development and where it is situated. It would not be a bad idea, because it is much more expensive to put in the chargers after the event rather than when the building gets under way. If it was a significant new development in the city centre, we

would look for charging points within it. I do not know whether that is the case throughout Scotland or if it is even appropriate for more rural local authorities.

David Duffy: The other officer who helped with REHIS's contribution works for Edinburgh City Council, which has a strategy for how it approaches the target and threshold for deciding whether EV points should go in. REHIS took that opportunity and we put one in because it was a good contribution, but that was delivered through the city council's strategy. Perhaps all local authorities can learn from the council's strategy.

Angus MacDonald: How much would it cost to retrofit a charging point?

David Duffy: I am not sure about retrofitting. The total cost of the charging point that REHIS paid for was less than £5,000. It depends on which type of unit is purchased. There are fast charge, soft charge and other options.

Mark Ruskell: Are there examples of planning applications being turned down because of their impact on air quality, or of housing allocations that were transferred within a local development plan in Glasgow or elsewhere?

Vincent McNally: I am not aware of any applications that have been refused recently. There is a change in how applications are submitted. Many of them are front-loaded. Air quality is considered and they are designed to mitigate the impact of the development. We sometimes go back with suggestions for conditions to go on planning consents, but I am not aware of any applications over the past, say, 10 years that have been refused on air quality grounds.

Dr Hamilton: I was involved in a planning hearing in 2011-12 for a domestic waste after treatment incinerator that was planned for Perth city centre. I was the expert witness on behalf of the council. The development was rejected by the Scottish Government's reporter on air quality and odour grounds. That was a specific case but it was an industrial facility.

The Convener: I thank the gentlemen for their time. The session has been fascinating. If further thoughts come to mind, please share them by way of follow-up emails.

I would be interested in the locations of the trees that are not trees in Glasgow so that I could visit them the next time I am in the city. I promise to take public transport rather than using my polluting diesel car.

Subordinate Legislation

Development of Water Resources (Designated Bodies: Modification) (Scotland) Regulations 2017 (SSI 2017/347)

Water and Sewerage Services to Dwellings (Collection of Unmetered Charges by Local Authority) (Scotland) Amendment Order 2017 (SSI 2017/348)

12:14

The Convener: Agenda item 3 is consideration of two negative instruments. I refer members to the papers and invite comment.

Richard Lyle: My comment relates to the Water and Sewerage Services to Dwellings (Collection of Unmetered Charges by Local Authority) (Scotland) Amendment Order 2017. I note that the order

“makes each local authority responsible for the collection of the charges payable for water services and sewerage services that are provided by Scottish Water to dwellings”

in their area, and that it amends the Water and Sewerage Services to Dwellings (Collection of Unmetered Charges by Local Authority) (Scotland) Order 2014 by extending its provisions for a further two years from 2018 to 2020.

I also note that the Scottish Government's negotiations with the Convention of Scottish Local Authorities and Scottish Water concluded that

“at COSLA's request, during the 2 year extension period the Scottish Government would carry out a formal review of the collection options to inform the next order. This review will get underway later this year.”

I hope that the review will determine that the responsibility for collecting the charges should stay with councils.

I note that the

“total amount deducted for the cost of collection in relation to services provided in each financial year was fixed at £18.25 million.”

By my calculations, each council will get, on average, more than £0.5 million from the collection of the charges. I hope that that additional revenue will stay with councils.

The Convener: No other member wants to make a comment. I duly note that the committee does not want to make any recommendations in relation to the instruments.

Petition

Single-use Drinks Cups (PE1636)

12:16

The Convener: Agenda item 4 is consideration of petition PE1636, by Michael Traill, which calls on the Scottish Parliament to urge the Scottish Government to introduce legislation requiring all single-use cups to be 100 per cent biodegradable. Details of the committee's previous work on the petition are set out in paper 5, which suggests a range of possible options available to members. I invite comments and suggestions on ways forward.

John Scott: I welcome Roseanna Cunningham's letter on the petition, which states that the minister has asked Zero Waste Scotland to look into the issue and that an expert panel will be appointed to look at whether something can be done to reduce the impact of the problem.

The Government is making good progress, and I am happy with the action that is being taken. We should keep the petition open and consider it from time to time, at least until the Government has firmly taken up the baton and is starting to run with it. After that, the work on the petition will have been done. As I said, I would keep open the petition for the time being in order to encourage the Government to remember it.

Claudia Beamish: I support John Scott's views. Making all single-use cups biodegradable is one of a range of ways in which we can reduce and simplify waste for the future. It is an important option that will help to focus minds, but there are a range of other ways of having simpler packaging, although we will certainly still need packaging for some things. I support keeping the petition open to help to focus minds.

The Convener: Are we content to take Mr Scott's suggested way forward?

Members indicated agreement.

The Convener: At its next meeting on 21 November, the committee will consider subordinate legislation and the Wild Animals in Travelling Circuses (Scotland) Bill at stage 2. As agreed earlier, we now move into private. I ask that the public gallery be cleared

12:19

Meeting continued in private until 12:40.

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