OFFICIAL REPORT
AITHISG OIFIGEIL

Environment, Climate Change and Land Reform Committee

Tuesday 13 November 2018

Session 5

The Scottish Parliament
Pàrlamaid na h-Alba

Tuesday 13 November 2018

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ENVIRONMENT, CLIMATE CHANGE AND LAND REFORM COMMITTEE
32nd Meeting 2018, Session 5

CONVENER

*Gillian Martin (Aberdeenshire East) (SNP)

DEPUTY CONVENER

*John Scott (Ayr) (Con)

COMMITTEE MEMBERS

*Claudia Beamish (South Scotland) (Lab)
*Finlay Carson (Galloway and West Dumfries) (Con)
*Rhoda Grant (Highlands and Islands) (Lab)
*Richard Lyle (Uddingston and Bellshill) (SNP)
*Angus MacDonald (Falkirk East) (SNP)
*Mark Ruskell (Mid Scotland and Fife) (Green)
*Stewart Stevenson (Banffshire and Buchan Coast) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Andy Cope (Sustrans)
Katy Dickson (Scottish Land & Estates)
Ian Findlay (Paths for All)
Keith Irving (Cycling Scotland)
Dr Andy Jefferson (Sustainable Aviation)
Bruce Kiloh (Strathclyde Partnership for Transport)
Rebecca Kite (Freight Transport Association)
Patrick Krause (Scottish Crofters Federation)
Andrew Midgley (NFU Scotland)
Jess Pepper (Transform Scotland)
Professor David Reay (University of Edinburgh)
Martin Reid (Road Haulage Association)
Pete Ritchie (Nourish Scotland)
Kate Rowell (Quality Meat Scotland)
Professor Eileen Wall (Scottish Environment, Food and Agriculture Research Institutes Gateway)

CLERK TO THE COMMITTEE

Lynn Tullis

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Environment, Climate Change and Land Reform Committee

Tuesday 13 November 2018

[The Convener opened the meeting at 09:30]

Climate Change (Emissions Reduction Targets) (Scotland) Bill: Stage 1

The Convener (Gillian Martin): Good morning and welcome to the 32nd meeting in 2018 of the Environment, Climate Change and Land Reform Committee. I remind everyone present—including myself; I will just check—to switch off their mobile phones, as they might affect the broadcasting system.

Under agenda item 1, the committee will take evidence on the Climate Change (Emissions Reduction Targets) (Scotland) Bill. This is the fourth of the committee's evidence sessions with stakeholders. Today, we will hear evidence from three panels on the sectoral change that is required to meet the targets that are set out in the bill. We will consider agriculture, freight transport and active and public transport.

I am delighted to welcome our first panel of witnesses this morning, who will focus on agriculture. Joining us are Andrew Midgley, environment and land use manager, NFU Scotland; Pete Ritchie, director, Nourish Scotland; Katy Dickson, head of policy, Scottish Land & Estates; Kate Rowell, chair, Quality Meat Scotland; Patrick Krause, chief executive, Scottish Crofters Federation; Professor David Reay, University of Edinburgh; and Professor Eileen Wall, Scottish Environment, Food and Agriculture Research Institutes Gateway.

I will open with a general question about what has been done to date with the Scottish Government's approach. How well has the Scottish Government's approach to encouraging low-carbon farming practices—for example, in the farming for a better climate programme—worked to date?

Professor David Reay (University of Edinburgh): My perception is that it has not worked very well. The farming for a better climate programme gives some great exemplars. If they were implemented across Scotland, that would be a huge success. However, we are all very concerned about emissions, and they are not really going down in the sector. We need either much more uptake from those exemplar farms or a different approach.

The Convener: How can things improve? What is missing? There are exemplar farms, but you have said that there has not been a huge uptake. What would be the right strategy to get that uptake?

Professor Reay: I suspect that we have loads of really good practice, but a lot of farmers and landowners need to know about that and need more support to implement it. We have some great exemplars, but it is about bringing the average up in adopting low-carbon strategies. That will also give increased productivity. I think that we will discuss how to do that.

Time is running out for voluntary measures only and relying on people seeing and adopting good practice through word of mouth. There can be a more incentive-based approach. If there is good practice that delivers on climate change and other key objectives, including increased profitability, it needs to be overtly incentivised.

The Convener: Maybe people will want to pick up on your statement that the time for voluntary action is running out. I imagine that the NFUS and Scottish Land & Estates will have something to say about that.

Andrew Midgley (NFU Scotland): To answer your first question about how far we have gone and how good the approach has been and to echo the points that Professor Reay made, I would say that there has been lots of good work but it has not had the reach that it should have had or that we would like it to have had. From our perspective, climate change is not at the top of the priority list. There is so much else going on that other extremely important issues take precedence. Issues such as Brexit and the future of farm support are critical to the future of the industry.

From our perspective, tackling climate change is not necessarily at the top of the Scottish Government's priority list for agriculture. Addressing climate change in the industry is at the crux of the way forward, and the Government is not demonstrating that it is driving that change. We are left with initiatives—however laudable and excellent in what they are trying to achieve—that will only ever have limited reach, because the emphasis seems to be elsewhere.

How do we change that position? The Government has a huge role to play in setting the direction of travel and the priorities for the long term. Clearly, the NFUS has a role to play in that, too. If we want to, collectively, we can put much greater emphasis on climate change than we do today. We are willing to work with the Government to do that.

There is then the question of which measures we want to adopt. It is probably useful to be a bit more subtle than to talk about voluntary versus mandatory measures. When the United Kingdom Committee on Climate Change took evidence recently in Edinburgh, whether there should be voluntary or mandatory measures was a crux issue. We argued that there should continue to be voluntary measures. If we were to take a slightly more subtle approach, we could think of a spectrum with voluntary measures at one end and regulation at the other, and education through incentive to regulation could be mapped on to that spectrum. Our position is that regulation is not necessarily the best way to encourage people to change their behaviour; we are more likely to achieve results through incentives and education. That is where the emphasis should be.

In our "Steps to Change: A New Agricultural Policy for Scotland" document, we have set out a structure of farm support that would include measures to support active farming that delivers on mitigating emissions. There are ways of reducing emissions that encourage behaviour change without necessarily resorting to changing the law to force people to do things, because that might not be the most constructive approach.

The Convener: Would anyone else like to come in on that general question?

Patrick Krause (Scottish Crofters Federation): I add support to what Andrew Midgley has said. The Scottish Government could do more to help. The committee will have heard me say previously that crofting exists in an area that is noted for its high nature value but the Scottish Government's agri-environment schemes almost exclude crofters because they are inaccessible. That is a specific example of what Andrew Midgley is talking about. The Scottish Government could do more with what we have at present.

The Convener: What makes such schemes inaccessible?

Patrick Krause: It is the way in which they have been set up. The schemes are based on a points system. Small producers—not just crofters but smallholders, small family farms and so on—find it almost impossible to gain the points that they need. Larger industrial agribusinesses employ consultants specifically to write their proposals.

Katy Dickson (Scottish Land & Estates): I, too, add support to what has been said. We do not believe that the voluntary approach is not working, but it is simply not working well enough. The schemes that are in place are fantastic, but they are not resourced efficiently to ensure that everyone can access them, as Patrick Krause said, and farm to the benefit of their business and the environment. We need further education, to understand the baselines from which we are working and to make it easy for people to make those differences. Brexit brings the opportunity for the Government to align good practice and ensure that everyone understands where it is trying to go. Scottish Land & Estates very much has a role in that, as well as in ensuring that people learn from where farming is being done sustainably, so that that can be rolled out across the country.

The Convener: There is also a financial and economic argument for farming sustainably. Does that get put across as much as it could?

Katy Dickson: It could be put across better, but sometimes it takes more than statistics or figures to convince people. They like to see examples in which somebody stands up and says, "This is the real difference that farming like this has made to my business."

Mark Ruskell (Mid Scotland and Fife) (Green): The convener mentioned the farming for a better climate programme. How successful has that been relative to other schemes? I was reading a number of the submissions about the origin green programme in Ireland, which I gather has delivered 117,000 beef carbon assessments and 20,000 dairy carbon assessments. Where do you see our programmes relative to best-practice programmes in other countries?

Pete Ritchie (Nourish Scotland): As Andrew Midgley said, we simply have not been clear enough that this is a priority for Scottish agriculture. If we were serious about doing this, we would invest resources that are commensurate with the scale of the challenge. As the NFUS said in its evidence, it is not an easy problem. A lot of small businesses, which are often not particularly well capitalised or well resourced in terms of management time, will have to change their practices. That is still the challenge that we have.

The origin green programme shows what it looks like when you to try to do something at scale. We have not been doing anything at scale and, as Katy Dickson said, we have not given the clear message that doing better on greenhouse gas emissions equals doing better on profitability. The Quality Meat Scotland figures show clearly that more profitable farms generally produce lower greenhouse gas emissions. We need to get the message across very clearly and help that long tail of farmers who are not doing well on greenhouse gas emissions and profitability to do better. That means a massive increase in the amount of training, support and advice; it means working with people and taking them with you.

I agree that regulation is a blunt instrument, but it will be needed soon if we do not rapidly scale up what we are doing. It is not just that we are not

going to meet our climate targets; our reputation as a producer country will go downhill. It is undeniable that people's attitudes towards meat and dairy consumption are changing. Retailers are increasingly looking for evidence of sustainability. That is what the origin green programme is about. It is about producers convincing the supply chain that they have got their act together on climate change. If we do not convince the supply chain of that, Scottish produce will be less sellable in the international market.

Andrew Midgley: Farming for a better climate is a good initiative. Its precursor was the monitor farm work, which was established as a good way for farmers to open up their business to explore the future of that farm with their neighbours. It was a learning experience that had demonstrable benefits. We took it from New Zealand.

When we came up with farming for a better climate, the intention was to build on that monitor farm work as a good way of sharing expertise and knowledge. That logic is still robust and it stands, but I understand that the farming for a better climate programme is being assessed and we are waiting for the outcome of that assessment. The question is one of scale and how to scale from the farms and people involved to a much wider-ranging industry.

The origin green programme is a different way of doing it in that, according to my understanding of it, it is led by the Government deciding that it wants to achieve a market benefit for the industry by improving environmental performance. That is quite a top-down approach. It is being led from the front. In order to do that, there has to be widespread uptake of measures across the industry to ensure that such a label has some sort of legitimacy. It is a different mechanism that can be used to achieve change across a broader spectrum of the industry. The two programmes are slightly different.

09:45

Patrick Krause: I am interested in what my two colleagues are saying, because it touches on an issue that we in crofting have thought about a lot, which is how we market croft produce. Over many years, we have had a great deal of advice on how to sell directly and how to use niche marketing and so on. When we started doing that, such things were not in the main stream, but they are now.

The Brexit catastrophe presents us with the question of how we are going to compete in the international market, which Pete Ritchie talked about. The basis on which we can sell produce involves our credentials on the environment, quality and provenance. That gives the consumer the message that we are presenting something that is good food. In that regard, it struck me that Kate Rowell's organisation is not called Quality Meat Scotland for nothing. That is where we need to be heading—quality. Quality means traceability and produce that is good in terms of the environment, climate change and so on. Therefore, even when we are being production focused and profit focused—crofters also need to make a profit—we have to bear in mind that that is how our business is going to succeed. We need to be seen on the international market as producers of quality produce.

Kate Rowell (Quality Meat Scotland): We have done quite a lot of research into origin green in relation to our standards. We have the farm assured scheme for Scottish beef and Scottish lamb, and we have looked at the origin green standards in comparison with ours. Those standards push farmers to put sustainability into their standards, which is laudable. Personally, I think that that is the way we have to go. However, the problem is that we run a voluntary membership scheme for farm assurance and, if you push too fast too quickly, people do not come with you. We are definitely considering the issue. Some impetus from other parts of the industry—or from the Government—might help other people to come along with us on those schemes. I must emphasise that we have not done anything about it yet, but we are actively looking at it.

Mark Ruskell: Is the fact that you have to cajole people to take up such a scheme just one of the problems with voluntarism?

Kate Rowell: You have to persuade farmers to see the benefit of a farm assurance scheme. They are paying for it, so they have to see a benefit from it. If you make life too hard for them, they will not get involved in the scheme.

John Scott (Ayr) (Con): I must declare an interest as a farmer and landowner, and as a member of the NFUS. I would like to put some figures on some of the issues that have been talked about. On the lack of dedicated staff in the Scottish Government, I believe that it was the NFUS submission that said that there is just one full-time equivalent person in the Scottish Government dedicated to reducing carbon in agriculture. Am I correct?

Andrew Midgley: My experience in the policy area is that there is one go-to person who leads the climate change stakeholder work. However, I am sure that the Scottish Government will probably say that you should look at all the other stuff that it does in terms of advice and so on.

John Scott: How many people have been through Scotland's Rural College's farming for a better climate programme this year? Is it 1,000? Kate Rowell, do you know that?

Kate Rowell: I am sorry; I do not.

John Scott: I am sure that I saw that in one of the submissions. I believe that there are 12 monitor farms and that, in total, 1,000 people will have been involved in that programme this year. If those figures are correct, that shows you the scale of the problem, given that there are—if my memory serves me correctly—about 20,000 farmers and crofters in Scotland. There is certainly a need to roll out that programme.

Kate Rowell, your submission—perhaps challenging the view of Professor David Reay—highlights the view of Quality Meat Scotland that the current systems of measurement for carbon output are not adequate. Could you expand on that further?

Kate Rowell: I did not write the submission, but I will do my best. I have been in the job for only six weeks, so please bear with me.

The problem that we have with the measurement of emissions is that it is a very blunt instrument. We are counting the number of cows—that is basically how we are measuring emissions from cows. To make an analogy with the transport industry, that is exactly the same as counting the number of cars and not taking into account anything that car manufacturers are doing to make individual cars more efficient. We were recently privileged to be at the SRUC's green cow facility, where the emissions from cows are measured and cows are given different feedstuffs and additives to see what difference that makes to their emissions. In the current measurement system, that is pointless, because there is no mechanism for more efficient cows to be measured.

I am a farmer as well as being the chair of Quality Meat Scotland, and I am going home this afternoon to pregnancy diagnose all our cows. The best result for me would be that every single cow is going to have a calf, and the best result for efficiency is that every single cow is going to have a calf, because we have fed the cow and she has produced all her emissions, so we want a calf from every cow. The trouble with the measurement system that we have at the moment is that that is almost the worst-case scenario, because it would double the number of cows, so even the most efficient farmers are adding to the figures. We would like there to be investment in research for a new, world-leading measuring system for agricultural emissions.

The Deputy Convener: Thank you. Professor Wall—would you like to comment on that?

Professor Eileen Wall (Scottish Environment, Food and Agriculture Research Institutes Gateway): Kate Rowell referred to the research. A lot of work has been done across the UK Governments on improving our national inventory, which is simply refining the counting of cows, and taking account of management systems, dietary elements and—to continue the analogy with makes of cars—differences between breeds. There are ways of doing it; it is not impossible. The underlying aim is that, however big the population is, if every one of Kate's cows is pregnant—the hope is that 100 per cent of cows will calve this year—the calves will automatically be included in the audit.

That does not really give any measure of emissions efficiency, however. That 100 per cent calving rate would massively improve the efficiency of her breeding herd, compared with if it was down at 80 per cent, if you look at the return of product from the whole system. That is where we get into the conflict between what we are required to report on an inventory, which is absolute emissions—which is a factor of the number of animals and how we are planning, ploughing and managing our fields—versus the efficiency per unit of product. The stuff that we are doing on the policy side and on the research side is helping to inform that debate.

Claudia Beamish (South Scotland) (Lab): There is an extremely interesting discussion to be had about measurement that should perhaps feed into the Climate Change (Emissions Reduction Targets) (Scotland) Bill. I was on the Rural Affairs, Climate Change and Environment Committee during the previous session of Parliament, when our remit included agriculture and climate change—we will leave aside the discussion about whether the division is good or not. I heard a lot about excellent practices and developments that have been happening for a considerable time.

Also, as a rural dweller, I know about the isolation that families who work in farming, forestry or land use more broadly often experience, and I question why programmes such as farming for a better climate, which John Scott mentioned, have not spread more. Is that something that the witnesses could comment on?

I am thinking about issues that are raised with me, which the witnesses will all know far more about than I do, including dietary change for animals—rather than for humans; we will have that conversation later—genetics, for which money is available in the agri-environment scheme, and development of soil testing. Why are such things not being shared so that we are in more of an agroecological environment? I am sorry to go on for so long, but those activities help profits in farming, as has been highlighted, so why are we still where we are?

Professor Reay: The others on the panel know much more about the barriers than I do. As an

academic, I suggest that one of our issues is knowledge transfer. We need to get better at that.

There will be a host of reasons why we have only 1,000 rather than 20,000 stakeholders taking up good practice through farming for a better climate. One of the comparators that I have looked at is Denmark, which had a similar big problem with high use and high waste of nitrogens in agriculture. Although there was a lot of good practice—as we have—many landowners and farmers were not accessing information and implementing good nitrogen-use efficiency. Regulation was therefore brought in to address the large number of farmers who, in essence, needed help to move up. That has been successful for Denmark. Denmark is still not as good as we are on that—it uses more nitrogen—but nitrous oxide emissions there have come down significantly, whereas ours have not. There are lessons to learn from Denmark.

Andrew Midgley: The question is on the spread of change and why we have not gone further. We have to think about the folk on the ground; it is hard to generalise, because in any walk of life there is a spectrum of folk. There will be people who are fully committed and signed up environmentalists. What do people want to do? They want to grow high-quality crops, manage their land well, rear high-quality animals and be viewed with respect in their communities. If we are completely honest about it, climate change emissions reduction is still not right up there as a thing that people are judged on among their peers. As I said, it is difficult to generalise and I do not want to do so in a negative way, but the reality is that climate change has not risen so far that it is seen as a critical thing to address.

For the NFUS, there is a really important point about how it will all happen if we are to achieve what we want, which we have tried to convey in our submission. The climate change agenda might be seen as someone else's agenda rather than as our collective agenda: that is a really important issue that we must address. Obviously, the agenda is for all of us, and that is what we have to work on.

We have individuals and their practice and we have the industry—bodies such as the NFUS and people who represent the industry. Both are actors in this. It is unfortunate that sometimes when climate change is raised it is done in a way that feels like an attack so, as an industry, we end up defending. That is not a constructive way to get to the point at which climate change is accepted as a collective issue. At the moment, the approach is still almost a confrontation rather than a collective effort.

The Convener: John Scott has a short question on that.

John Scott: On Professor Reay's point—I defer to his knowledge—does the panel agree that there is an opportunity with the proposed agriculture bill that the Cabinet Secretary for the Rural Economy has said he will introduce to deliver a half-way house between regulation and the voluntary code of practice? For example, to qualify for future support, farmers could have a menu of options, given that the 20,000 farms in Scotland are all different. If they were to tick, say, six of 10 options that would be available on a menu, they would qualify thereafter for agricultural support. Crofters might have fewer options being open to them, so they could be looked at differently.

10:00

Professor Reay: I agree absolutely. I have discussed exactly that with John Scott before. As Andrew Midgley described, the issue is how to bring everyone along with the idea.

Denmark made some serious mistakes in implementing policies to drive change. It has had some successes in mandatory action, but it lost a large amount of support from the farming community, which has set the country back. We can learn from that and not make the same mistakes. There are good exemplars in the Danish situation, but there are also exemplars of what not to do.

John Scott suggested incentives to good practice that would be voluntary, but the farmer who chose not to have a low-carbon strategy would not be eligible for incentives. That could be very effective.

Katy Dickson: I agree with that approach. It is important that everyone sees the opportunity for the individual as well as how activity feeds in to targets.

If people are to take land out of active production or change their business significantly and invest to do that, we need to ensure that they can trust the system and know that in the long term it will support them. Otherwise, people will say that the system will just change in the future, or that the good thing that they are doing has no impact, because their neighbours are not doing it. We need to make sure that everybody is on board.

Professor Wall: I also support the idea of incentives. The evidence is that a menu of options may be the best way forward. We have been working on the carbon-auditing side of the beef efficiency scheme. That scheme has been rolled out just over the past year. We get feedback in conversations with farmers. We discuss inefficiencies and use that as a tool to focus on what will work for the individual. It is early to use that to underpin a whole act, but it highlights that

everything in the system can be bespoke, at a given point in time.

Climate change is long term and cows are long lived. To improve efficiency, it is not possible to make a decision on one day for one five-year period for the Scottish rural development programme funding, and then to expect that changing the message the next time round will continue to have the same benefit in the target rates as the previous one.

The Convener: We will move on to questions from Stewart Stevenson on a similar theme. There will be an opportunity for the panel to come in on those points.

Stewart Stevenson (Banffshire and Buchan Coast) (SNP): I declare that I have a very small registered agricultural holding.

I want to explore the numbers and mathematics. Given that biomathematics and statistics Scotland is part of SEFARI, Professor Wall should be on high alert immediately.

The target in the bill for 2050 is 20 per cent, and net zero emissions is also being discussed as an option. Neither target is for the agricultural sector. We have heard that many things can be done in the agricultural sector that are economically beneficial while they also support the climate change agenda.

Would it be cheaper, given that we have a quarter of Europe's tidal power, to put all our investment in tidal power and let farming get on with it? That may well take us to net zero emissions.

Professor Wall: I cannot speak for the whole of the economy and all its various sectors. Certainly, it is a fact that if we are going to have agriculture, with its livestock and crops, there will be emissions. More than 70 per cent of the land in Scotland is suitable for livestock—the quality product that Kate Rowell and Quality Meat Scotland promote globally, and which has brand recognition. That land needs to be managed. If we can make money and achieve climate benefit and wider ecosystem benefits from it, and foster community stability, why would we do what you suggest? We should still invest in tidal energy, however; a multisectoral approach is required.

Stewart Stevenson: I am being deliberately provocative; I am not advocating investment in tidal power as the magic bullet. What I am really asking is whether an attempt is being made across all sectors, including agriculture, to work out what climate benefit we get for every £1 that we invest. In other words, is an attempt being made to find out how many pounds we should put into agriculture, power generation, transport and so on? It is worth bearing it in mind that not all the money is public pounds. Is any work being done to address that? I see that Professor Reay wants to jump in.

Professor Reay: That is a good and provocative question. We want least-cost carbon reduction. In all sectors—including agriculture—there are areas in which reduction can be achieved at no cost or negative cost. We cannot, however, get to net zero greenhouse gas emissions simply by having loads of tidal energy because that will not sequester carbon. We will also still have emissions of methane and nitrous oxide from other sources.

Stewart Stevenson: I would like to pull you up slightly there. I understand what you are saying, but methane is a carbon equivalent, which means that if we have negative emissions from electricity generation, in arithmetical terms, given the way in which the targets are structured, we would be offsetting the methane without reducing it. On top of that—this is a complex issue—methane disperses very rapidly, whereas carbon dioxide is there for hundreds of years.

Professor Reay: On energy generation, we could get to zero carbon, which is where we need to get to, but we will still have emissions from agriculture and land use that we cannot fully mitigate unless we have sequestration. Globally and in Scotland, that must be part of the strategy. We cannot just address the issue in the energy sector. In fact, we cannot meet our net zero emissions target without agriculture being a key part of delivery.

Pete Ritchie: With regard to the suggestion about a menu of options, I do not think that that is good enough as a response to climate change. We cannot simply say, "We're going to have a new farm support scheme, and one of the options is to do something about climate change." Tackling climate change must be front and centre of what all of us—including all farmers—do. As Andrew Midgley said, we need a very clear signal from the Government that mitigating climate change is not optional for farmers, any more than it is for any other sector of Scottish society. It is an issue that we are all invested in, and which we should all be doing something about. It is not enough just to have one option that farmers can take, but do not have to take.

Whatever shape the post-2020 support system takes, we must move towards a position in which every farmer is doing something about climate change. It is very clear that that is where public opinion is going. If control of farm support lies at Holyrood, people will want to see farmers doing their bit alongside everybody else. That does not mean punishing farmers; it means getting behind them and working with them over the long term. It takes time for farmers to change their practices

and to change their herds. It will take a long time to get the new genetics into our herds, for example.

People do not take such measures quickly, because they are running small businesses. If what they are currently doing works and there is no significant reward for changing, why should they take the risk? If what they are doing works well enough, that is an incentive for them to keep doing what they are doing. The Government needs to walk alongside people to help them to make the changes.

We must continue to recognise that the reputation of Scotland's produce depends on our doing a really good job, and being seen to do a really good job, on climate change. It is true that we will never reduce agriculture emissions to zero—nobody is suggesting that we will—but we can make sensible reductions that will increase the profitability of farming and we can lock up a lot more carbon in Scotland's soils than we are locking up at the moment. Such perfectly sensible strategies can help the industry and will not undermine it.

Stewart Stevenson: I will close off the bit of my questioning about how farming will have to change. Is there a list that a farmer can look at to help them understand the order in which they will get the best benefit? As we already know, there are an awful lot of things that farmers could be doing, but do they know which ones to hunt for first? There will be different answers for arable farming, beef farming, hill farming and so on—I understand that—but is there a list of the kind that I have outlined?

Professor Wall: That list is one of the things that the farming for a better climate programme is coming up with, and the education and communication around that vehicle have been very successful in identifying some of its elements. However, the options are very broad, and the specifics that will work for one particular system at one particular time need to be managed. It is all about having a conversation about—and an understanding of—the fact that something might work one year but not the next. The question is how we take that from the education and awareness stage to the understanding and uptake of best practice on a farm at any one time.

Of course, it will also depend on what has already been done—in other words, the added benefit. The options do not necessarily work independently of one another; a lot of them have additional and cumulative benefits that we should be trying to capitalise on. Again, that is part of a longer-term conversation to reach a certain level of understanding of how this works in practice. What works very well is being able to highlight particular examples.

Katy Dickson: We need to be careful of what we count as agriculture. We need more recognition of the other things that farmers are already doing and which do not count towards agricultural impacts. They might already be planting trees, carrying out peatland restoration or have other on-going activities, but all that the figures show is that agriculture is not improving.

I find it interesting that rough grazing is not counted as agriculture and that all the soil underneath such grazings is not seen as used or productively farmed land—I am not quite sure what the term is. As I have said, we need to be careful, because a lot is happening that is not included in the figures.

Stewart Stevenson: So we should really be looking at the whole land use, land-use change and forestry—or LULUCF—area.

Katy Dickson: We should carefully assess which things sit in which category and be really careful not to draw a definite line between the categories. They are all part of land use. It could be useful to understand that better.

John Scott: Although I appreciate the different synergies and ways of working, I am going to make things awkward and ask each of the panel to give me one solution, given that we are looking for lists of solutions. Could each of you, in your own time, provide us with a brief solution for achieving the 90 per cent target and the net zero target?

The Convener: Who is going to go first?

Professor Reay: I should declare a bias as a nitrogen researcher, but my solution would be nitrogen-use efficiency, just because of the wins of improved productivity, reduced air and water pollution and reduced emissions through a reduction in nitrous oxide.

The Convener: Would anyone else like to chime in?

Patrick Krause: I am trying to work out how I can condense my 10 points into one, and I cannot do it. As a result, I will have to go for sequestration as a solution. The conversation that we have been having over the past 10 minutes is really key to the issue, and people have made some absolutely essential points. We have to look at this holistically. The area of carbon offset—the idea that if someone is doing something good, it is okay for me to do something bad—is somewhere we cannot go. We all have to be doing good, and striking the balance is, as Professor Reay has said, about locking the carbon up again. That is particularly important to crofters, given that we are conservation grazing on a lot of Scotland's prime peatlands. It is absolutely essential that we get the peatlands into a healthy state.

Andrew Midgley: I would focus on the fact that this is all about people. The solution that I will give you is not about what measure should be implemented but about what has to happen to encourage more action. We need to get a large number of people who are running businesses to change their behaviour.

I was really encouraged to hear that the majority back the suggestions on supporting action under future farm support, because that is what we have been suggesting. We support future policy change that enables people to work in a way that addresses climate change, and that happens through farm support. We also support the Government leading from the front—

10:15

The Convener: John Scott's question was about what sustainable farming could look like on the ground and what measures could be taken to change farming. If we are even to have a stab at achieving net zero, for example, what will that look like?

Andrew Midgley: We know the measures on nitrogen use—there is a big long list of them. One potential solution is to do with the circular economy and how we use nutrients in the wider economy and get them from where they are created to where they are used. Some work may be needed on that.

Pete Ritchie: I will rehearse things that people know. Improving animal health is the number 1 no-brainer. It is really important to get rid of some of the soil compaction that we should not have. We need to get more organic matter into our soils—that does not necessarily mean farming organically, but that is one way to do it. On nitrogen use, we could, quite simply, use a lot more clover. We have known about clover for hundreds of years, but we still have farms that do not sow clover in their mixes, which is strange. We could do a lot more on agriforestry. It is a good idea to have more trees on farms. We have had a culture in which farmers who have planted trees have been told that they have failed as farmers. We need a culture in which farmers are told that farms should have trees on them and that agriforestry means that we can maintain the same yields while locking up a lot more carbon and providing a lot of other biodiversity and flood-prevention benefits.

Professor Wall: Like Dave Reay, I, too, declare an interest: I am a geneticist. We have seen mitigation benefits in pig, poultry and dairy, and we can track at least 50 per cent of them to the genetic improvement that has happened over the past 20 years. To go back to Andrew Midgley's point, we do not have the same uptake of such tools in beef and sheep—in part, that is what the beef efficiency scheme is trying to address.

This is against my own interest, but that is about data and about farmers understanding what is happening on farms from year to year and making decisions on that basis. That information feeds into my research and the tools that we help to develop, but farmers need a discussion about what their calving rate is year on year and what they can do to improve. Getting into data-driven agriculture will underpin many of the actions that people have mentioned.

Kate Rowell: I echo that. We need to be as efficient as possible with our livestock; we need to be farming as efficiently as possible. Well-managed grazing is so important—it can increase the carbon sink of our grasslands. Getting the message out is the important thing. The answers are there; we just need to get them out there and taken up.

John Scott: Can anyone comment on whether soil pH is included?

Pete Ritchie: Yes, absolutely.

Claudia Beamish: My question is about transformational change, which is a topic that we have discussed a lot. The phrase "just transition" is used in some sectors—the energy sector, for example, and I am often asked what it means. I will not define it today, but it is an inclusive phrase. My question touches on some of the issues that we have been exploring together. To what degree is "just transition" a valuable phrase for agriculture, forestry and land use? I would like the panel's comments on that, after which I will ask a couple of quick follow-up questions.

Pete Ritchie: It is a very helpful phrase for agriculture. We know that agriculture in Scotland and across the world is facing a crunch point in delivering a sustainable food system. We have had massive losses in biodiversity globally and face the huge challenge of climate change. Agriculture needs to shift. To walk with farmers through that shift in Scotland means having a just transition. It means having a new deal with farmers and saying that we will support them if they will support us to deliver on our social objectives for climate change and the environment.

Taking farmers through that just transition is where the focus of our next farm support policy and our agricultural policy needs to be, because business as usual is simply not an option for farming.

Professor Reay: I think that "just transition" is a useful phrase. The point has already been made that there is a danger that agriculture in Scotland and around the world will be vilified as a problem

sector for climate change. We know from the special report "Global Warming of 1.5°", which came out a couple of weeks ago, that the urgency is very much ratcheting up. We need to avoid that vilification, because I see farmers as the champions in terms of where we go on climate change through to 2050 and beyond. When it comes to delivering on our climate change targets, there are many other positives, and that narrative needs to be the one that farmers, as well as the general public, hear.

Andrew Midgley: We support the concept of just transition. My understanding is that the concept came out of the union movement and that the intention is to try to deliver climate change action without that action having huge negative consequences for workers.

Claudia Beamish: And for communities?

Andrew Midgley: Yes. With such things in mind, my union thought that there was great crossover: there is going to be change in agriculture, but we can deliver that change without necessarily having huge job losses in the industry.

The Convener: Angus MacDonald has a supplementary question.

Angus MacDonald (Falkirk East) (SNP): I take on board Pete Ritchie's point that business as usual is not an option, but there is an argument that transformational change could result in land abandonment, not least in less favoured areas, which we should not ignore. I will quote some stark comments from the submission that we received from the National Sheep Association. The NSA says that it

"does not believe the ambitious targets laid out in the paper are realistic and with regard to the livestock sector we believe there will be serious impacts on red meat production for Scotland. With 85% classed as Less Favoured Area ... hill flocks managed across vast areas of Scotland already contribute significantly to reducing climate change targets purely by the way in which they graze and control grass growth where no other animal or human can do that."

It also states:

"If breeding sheep numbers were to be reduced, purely as a mechanism to meet GHG emission targets, then the social, economic and environmental impact would be devastating across rural parts of Scotland. People would simply disappear from the remotest areas, as without sheep and sheep farming, there will be no reason for people to live up many of the remote glens of Scotland. Evidence of this land abandonment can already be seen in many parts."

I just want to get those comments on the record. Does Patrick Krause want to comment?

Patrick Krause: We would agree with just about everything that was said there, except for the opening statement that we should not be trying for net zero. Certainly, in my experience of surveying crofters, once net zero is explained, people understand that it is a worthy target to go for. Why go for 90 per cent if we could go for net zero? The concept of net zero is really important. As I said, it is not about just having zero emissions but about the fact that we are managing our land in such a way that there is a balance. That equilibrium is what we are after.

The Convener: Mark Ruskell has some questions on this theme.

Mark Ruskell: I want to go back to how we manage transformations. There seem to be a huge number of possibilities around agriforestry, forestry and how the sector is addressing the situation. I think that it was Guy Smith from the NFU in England who said that there were big opportunities with a net zero carbon economy, and he very much pointed to timber. Culturally, is the agriculture sector taking those opportunities? It might mean a lot less sheep and beef, and a lot more timber.

Andrew Midgley: As it stands, there is probably a division of sorts between agriculture and forestry, but activity is on-going to try to counter that division. Several years ago, the woodland expansion advisory group sought to explore how the forestry targets could be met in the context of continuing agricultural production, and it found that it would be possible to meet the forestry targets without necessarily hugely reducing agricultural production. Since then, there have been initiatives involving sheep and trees to try to encourage extra planting on farms, which we have supported. We support the on-going efforts to encourage planting of trees on farms. In the range of things that farmers can do, that is on the credit side in terms of sequestration—it is a very positive thing.

A tension arises when the forestry industry buys whole farms, which has consequences for communities, especially in remote locations, and gets very contentious. Pete Ritchie may have more insight into this, but I know that, although agriforestry is in the current SRDP, it is not taken up to any great extent. There is an issue with the demonstration and spread of those ideas.

Mark Ruskell: Why is that? I gather that there was only one application to the SRDP last year for agriforestry, which seems counterintuitive, considering everything that we are talking about.

Andrew Midgley: When people apply for an agri-environment scheme, they look at what they have, their business and how they can match that with the scheme. They consider how they can deliver for the public good and how that fits with their business. Everyone always starts from what they have been doing. There is an element of stretching into something new and, I guess, there is inertia. It comes down to trying to demonstrate

the effectiveness or consequences of the change, such as saving money, the diversification of cropping and that sort of thing.

Work was done in the past by the Macaulay Land Use Research Institute at Glensaugh, but that has not really continued or been pushed out. There is potentially an opportunity to carry that work on.

Patrick Krause: My understanding is that the agriforestry scheme is really difficult to get into, which is why there are very few applications.

For me, Mark Ruskell's original question about forestry conjured up the issue of forestry blocks. We have to be careful about what we are thinking about. Industrial timber and monocropping have the same problems, including environmental problems, as monocropping in agriculture. As Pete Ritchie said, we have not used agriforestry enough. We should be heading for a cultural transition to the acceptance of trees on farms and crofts. It is not as simple as just trees; it is about what goes on under the trees. My understanding is that in quite a few locations we are pulling trees out because they have been drying out peatlands. Obviously, it is about finding a good mix and balance.

The Convener: We will have a quick question from Claudia Beamish before we move on to another theme.

Claudia Beamish: I just point out—I am not asking for comment on this, as it is not my question—that Tom Archer is doing agriforestry, so that might show the lead. Anyway, never mind about that.

We have had an interesting exploration of the issues with a mandatory approach and a voluntary approach. There is also the question of setting sectoral targets in the bill and breaking those down further. Pete Ritchie highlighted that point in Nourish's written submission in relation to agriforestry and other areas. That could be another way of pushing things forward. I ask him for a brief comment on that. We are running short of time, as we have a lot of other questions, so others might weave their comments on that into further comments about targets. However, as Pete Ritchie raised the issue in his submission, I ask him to comment on it.

10:30

Pete Ritchie: It is all part of asking for clear leadership from the Government on where we are going. As Mark Ruskell said, we introduced the agriforestry scheme in the last SRDP partly because of the woodland expansion advisory group, but there was no oomph behind it and no leadership. We asked the Government for a 10-year research and development programme to develop the approach at scale, but nothing happened. Nobody was responsible for promoting the uptake of agriforestry among farmers or ensuring that it happened. The same could be said of organics and a number of other best practices. It has been nobody's job in Government to promote them, and it has been left to the union or to individual farmers to make that move. We do not have leadership or direction.

Statutory targets might be a crude instrument, but at least they are one way of saying that we want to get to X by Y, or that something is good to invest in and we are signalling that we will invest in it.

I want to pick up briefly on the point that Angus MacDonald made about depopulation. There is a perfectly reasonable case for saying that it is really important that we maintain people in very fragile communities in parts of Scotland, and subsidising farming in a particular way might be the best way of doing that. Sometimes—although not always—sheep farming might be the only way of doing that. We have to consider matters much more on a regional and case-by-case basis rather than saying that we need to preserve the number of sheep at all costs in a national scheme. The number of sheep in Scotland is going down, and it will probably continue to go down whatever any of us does about that. Therefore, let us not get caught up in the idea that somehow the only way forward is to keep every sheep that we now have into the future.

Finlay Carson (Galloway and West Dumfries) (Con): I declare an interest as a member of the NFUS.

We have heard about various potential changes that there can be in farming for it to play its part in addressing climate change. Professor Wall, we know that SEFARI is looking into the effectiveness of the farming for a better climate programme and how effective the mitigation practices might be. What are the barriers to changing agricultural practices, such as those involving feedstocks or breeding, that we could face?

Professor Wall: It is about people. Andrew Midgley raised that point. A lot of the work that we are doing in SEFARI—particularly in this funding round, but it carries on from previous work—is about really trying to understand the KE and KT vehicles that get people understanding. It is also about understanding the barriers to uptake. We are only halfway through the current five-year programme and are not yet there with the answers, but we are already beginning to get messages about the KT vehicles and to learn from them. It is not the case that we have not said things in various ways; it is just that we have not said them correctly in all cases. Where there has

been uptake, we can demonstrate that it has worked. The issue is getting that out to the masses, to be crass about it. We are certainly doing research not just about what is happening with respect to the soils or the animals, but about understanding the behavioural change that will support that.

Finlay Carson: Do you think that just an improvement in the knowledge base or the passing on of knowledge would be enough to achieve a lot of the changes?

Professor Wall: The evidence is that we have passed on knowledge and have not achieved changes in all sectors and in all parts of sectors. Therefore, the way in which we have done things has probably not always been correct for the broadest of audiences. We are definitely learning from that and learning about the right ways to communicate. The farming for a better climate programme has been given as an exemplar. People seeing the knowledge working in practice has been a key part of the approach, but that is not the only vehicle.

It is not my area, but there is a whole heap of social science on understanding the behaviours of people. It is not just about the farmers; it is about the groups that support them and the policies that the Government puts in place. We are beginning to learn lessons, particularly in the more technologically advanced industries in which there has been uptake.

Stewart Stevenson: Will Professor Wall say what KT and KE stand for, for the benefit of the *Official Report*? We know what they mean, but others will not.

Professor Wall: Apologies. They stand for knowledge transfer and knowledge exchange.

Katy Dickson: I want to go back to an earlier point. We need to ensure that all the strategies are aligned. We have a land use strategy, a climate change strategy and a forestry strategy. We need to ensure that they talk to each other and are aligned and that we do not look at them only by the sectors. Every piece of land is not exactly the same. There has to be the right land use in the right area, and that use will be different across Scotland.

Andrew Midgley: The question around barriers is really complicated. I have been seeking to raise the issue of people and social change, but if we drill down to individual farms, there are structural issues to do with size and the capacity of a farmer to invest to deliver change. Farmers are running businesses, so there are market issues and issues around the degree to which the changes that they might need to make fit with their ability to make a living. In lots of cases, those issues are complementary, but they could be constrained by things that are hard to change, such as size and capacity. On top of that are the attitudes and behaviours and so on.

Finlay Carson: We need to address the lack of knowledge of the barriers.

Andrew Midgley: A lot of work has been done on that in relation to similar issues, such as the take-up of agri-environment work.

Pete Ritchie: There is also a more traditional approach to genetics and how you work out what a bull, ram or tup is going to be good for compared to how we do that in the pig and poultry industry. However, we and others have called for continued professional development as an area in which investment in a new scheme could help all farmers to learn a bit more about climate change and what they can do. That could be built into the programme.

Richard Lyle (Uddingston and Bellshill) (SNP): Let us look at agriculture emissions. The greenhouse gas methane makes up 44 per cent of those emissions, and the cause is cattle and sheep. Its global warming potential over 100 years is at 25. Carbon dioxide accounts for 29 per cent of agricultural emissions, its cause is land use and its global warming potential is 1. Nitrous oxide accounts for 27 per cent, its cause is nitrogen fertiliser and its global warming potential over 100 years is 298.

Kate Rowell hinted earlier that the only way to reduce those figures is the totally unacceptable suggestion that has been made by some people in society of doing away with all the animals, reducing animal stock or stopping using fertiliser in planting. They are ridiculous suggestions. We need to produce more good food, and we have farmers who can do that.

Are we at the limits of feasibility? Has the full range of options to reduce emissions in agriculture been properly examined? Have we discounted actions for technical or political reasons? Are we just tackling agriculture emissions wrongly?

Pete Ritchie: We are nowhere near the limits of technical innovation or feasibility. We could significantly increase the efficiency with which we produce the same amount of food while reducing nitrous oxide and methane emissions considerably through a mixture of genetics, animal health and the sensible use of fertiliser.

Scotland's nitrogen balance is getting worse. During the past 10 years, we have been wasting more nitrogen than we used to. We are not getting better and we are nowhere near where we could be with technical efficiency. If we become more efficient, we also become more profitable.

For Nourish Scotland, the idea that we are going to double production in certain sectors of Scottish

agriculture is a mistake. We need to improve profitability so that individual farmers can make a living and do the right thing for the environment.

Richard Lyle: I have sat here for the past hour and agreed with most of what the panel has said. Should we not take one farm, do it right, and then lead everybody else that way? Farmers have to earn a living. I live in the real world. We must also ensure that farmers produce the food that we need to eat. Should we not be doing that rather than sitting here criticising farmers or saying that they should do this or that and produce more trees and not have too many cattle? Should we not get an example farm for a couple of years and then lead people the right way?

Pete Ritchie: We do have some cutting-edge farms; there is no doubt about that. Some farmers go around the world to improve their practice and learn from others. However, Andrew Midgley has already talked about how slowly such innovation spreads and how challenging it is.

I agree that we need to praise the people who are doing well and show the headlines about why they are doing so well. How to get other people to take up such measures when they run small businesses that are often working on tight cash flows with minimum amounts of money to spend is still a challenge. It is not straightforward. It is not just about doing one thing that everybody will copy.

The Convener: Eileen Wall, do you want to come in?

Professor Wall: I was just going to echo what Pete Ritchie has said.

The Convener: Do you want to follow up on any of that, Richard?

Richard Lyle: I was waiting for Kate Rowell to come back in. I like to drive out in the country and see sheep and cattle in the fields. Some people believe that we should do away with them because they are causing too many emissions. Is that not a crazy suggestion?

Kate Rowell: Yes, it is. Getting rid of everything is definitely not the answer. That would just export our problem, because we would then bring in food from elsewhere, and there are water issues in other parts of the world. We have a huge resource that allows us to grow fantastic grass that we can then convert, through ruminants, into protein that we can eat. That is good for us all and works really well for the country and the economy. The red meat sector contributes £2 billion to the Scottish economy.

I want to echo what we were saying earlier. We have an industry development department and we want to run estimated breeding values—EBV—workshops. That is the science behind the genetics and choosing the animals that we want to use. To get farmers to want to come to those workshops, we often have to dress them up as something a bit more interesting to the farmers. We are calling them getting ready for breeding workshops, and we are kind of putting the science in by the back door. If we say up front that the workshops are about the science, certain farmers will definitely come because they are very interested, but a large proportion will just not think that it is for them, so we need to approach the issue in the right way.

The Convener: It is called marketing.

Kate Rowell: Yes.

Rhoda Grant (Highlands and Islands) (Lab): I will direct my question to Kate Rowell. Do recent improvements to accounting for agricultural emissions through the new smart inventory address concerns about the accuracy of the greenhouse gas inventory?

Kate Rowell: I am afraid that I cannot answer that question definitively, but I do not think so. As far as I know, we are still working on a very simple system of counting the number of cows. I am sorry, but I do not know enough to answer that question properly.

Andrew Midgley: The inventory was reviewed last year or the year before. The previous system used a very general set of assumptions about emissions per cow or per sheep. The inventory has been improved because it has been differentiated. For example, in dairy, there are three different systems, and there are different systems for beef that take into account age, feed and so on. We now have a much more accurate understanding of emissions from agriculture, which has reduced the amount of emissions that we attribute to the industry. Under the old inventory, we thought that we had one set of emissions, but, when we improved our understanding of the complexity of emissions and of how they are different in different circumstances, we found that the emissions were lower.

An outstanding issue is the degree to which the inventory is revisable. The inventory is still a collection of a set of assumptions and some data, which is brought together to give us a figure on emissions from agriculture. If we change what we do on the ground, that will not necessarily be reflected very easily in the inventory. That would be accounted for only if there was a sufficiently widescale change in behaviour that could be recorded in the assumptions through which the inventory is created.

We have improved the data in the inventory, so we have a more accurate understanding of emissions. However, as Professor Wall said, we

need to improve the data and continue to make it more responsive, so that it reflects what is happening on the ground.

10:45

Professor Reay: It is a good news story, I suppose, but Scotland and the UK are leading the world in terms of improving the resolution in the inventory. Nitrous oxide is a really good example in that respect. There is a lot of uncertainty about it in a lot of the world, so what is called a default emissions factor is used to estimate emissions from, say, a certain amount of nitrogen fertiliser. However, we in the UK and Scotland have gone way beyond that; we use something that has been developed specifically for us and which takes our climate and soils into account to give us a $10km^2$ resolution for nitrous oxide. We are therefore way ahead of most of the world on this issue, and it gives us a better basis on which to manage things. The inventories will always be a work in progress with regard to taking local information into account and providing a baseline on which we can act, but compared with most nations, we are actually really well placed.

Mark Ruskell: On the basis of consumer trends and compared with current consumption levels, it seems likely that we in this country will certainly be consuming less meat—though not, I would say, no meat—by 2050. Does that create opportunities for Scottish agriculture, particularly horticulture?

Pete Ritchie: If we can get it right, it will create opportunities for Scottish agriculture as far as livestock production is concerned. The argument will be about eating less but better meat and will give us an opportunity to demonstrate that we do meat better here. We do not want to turn all land over to trees, because using it for grazing purposes not only has great amenity value but has great conservation value. There is a good story that we could tell about sustainable livestock production in Scotland, but at the moment, we are not on track to get that right; we are just not going down that road.

There are certainly opportunities in field horticulture and protective cropping and we could be doing a lot more to grow the sector in Scotland to be not just self-sufficient but able to export. There is a huge opportunity to invest in horticulture, which is highly productive and generates a lot of jobs and revenue. However, we should not lose sight of the idea that we can do livestock production well—without keeping dairy cows inside all day and feeding them on imported soya. We can produce good animal products very efficiently from our own resources and then integrate that activity with tree planting and biodiversity work.

Andrew Midgley: The drive to eat less meat is an important social trend, but Scottish agriculture has a lot to be commended for. A lot of that particular narrative is based on international reports on livestock farming that take such farming as a whole, but actually it works in different ways in different places. Naturally, Scottish agriculture has a very good story to tell, and we should be supporting Scottish farmers. Even if what Mr Ruskell has suggested were to transpire, if we supported Scottish farmers, we could still have a bright future.

Mark Ruskell: Does your union cover the horticulture sector?

Andrew Midgley: Yes, we have horticulture members and a working group. Did you think that we just represented the livestock sector? We actually cover the whole thing.

Mark Ruskell: I was just interested in hearing whether you think that there is any jobs potential in horticulture with the shift towards a more flexitarian diet.

Andrew Midgley: There is potential, but it is not necessarily a zero-sum game.

Rhoda Grant: It seems to me that, although we might be measuring things, we are not doing it well—and it is even more worrying to hear that we are world leaders in this. Going back to the point about sequestration and the difficulty of seeing a farm unit's output, I wonder how we can encourage people to change their behaviour. They might be doing good things, but those are not measured against the bad things; and they might be taking the science into account to lower greenhouse gas emissions, but that activity is not being measured because the instrument in that respect is quite blunt and takes everything as a whole. How can we encourage people to change behaviour if we cannot really reward it?

Andrew Midgley: There are lots of different issues there that it is important to tease out.

The inventory works at a national level. It will always be the best that we can do and it is never going to be absolutely perfect, but we have to work with that. In our submission, we said that there is an issue around how things are reported in agriculture. That relates to your question about how we can encourage people to buy into the approach. At the moment, the inventory views agriculture as a collection of measures that are only about emissions. The things that farmers might do on the positive side—around sequestration, for example, or reducing the amount of energy consumption on their farms—tend to be viewed in a different box. Agriculture gets talked about as being a problem because of that, but farmers do not work in only one box; they do lots of things in different boxes, but people talk

about them only in relation to the box that has the problem. That positions farming as somehow just being about emissions and, therefore, just being a problem. We would like some work to be done to better reflect what farming does as a whole, because then farming would be able to tell its story fairly. At the moment, it feels more like farming is being attacked, because it does not seem like all the good that we do is represented.

We have to work within certain structures in relation to the inventory, because of internationally agreed standards, but if it were possible to arrange for some sort of shadow way of accounting that enabled that story to be told, that would be a positive thing, because it would enable proper acknowledgment of what the industry is doing.

Pete Ritchie: We agree with that, but we also think that it is important that individual farmers know how they are doing and can get some feedback on that. That is why we want the new farm support scheme to focus much more on a whole-farm plan, so that people can look at a range of factors, with climate change front and centre. Those factors include estimated breeding values, soil compaction, animal health, woodland planting, carbon emissions from farm machinery and the use of fertiliser, slurry and manure. The whole-farm plan should consider all of those factors and examine what sort of things the farmer would need to do to make improvements in that regard over five years.

I completely agree with Kate Rowell's earlier point; we need farmers to be much more data-driven and we need to have much more data at our fingertips about how we are doing and how we are getting better. After the next round of farm support, there is an opportunity to use the whole-farm plan model to help farmers to put climate change front and centre in their planning and to support them to make changes—not one year at a time but over at least five years.

Kate Rowell: Our farm is part of a pilot project that is run by the Scottish Agricultural Organisation Society called carbon positive. I think that it wants to roll out a system whereby every farm has a number that shows what it is contributing positively, so that farmers do not always feel that they are starting right at the back and that the job is just too big. If you have a positive figure and a negative figure, and you can see where things can be fixed, you have something to aim for. If you have only a negative figure, where is the incentive to do anything? That project is due to be reported on soon, and I strongly urge you to read that report.

The Convener: John Scott has a question about the climate change plan itself.

John Scott: How should changes to agricultural practices, including the use of fertilisers, feeds and so on, be prioritised in the next climate change plan?

Professor Reay: I have some fairly negative opinions about the climate change plan's provisions in terms of action and metrics of success. In the context of everything that we have discussed today, what would be great is something that is verifiable.

For example, we need a nitrogen budget for Scotland, but at the farm level, where it really counts, we need support mechanisms to be in place to improve nitrogen use and efficiency. That comes down to soil testing, beyond pH, and nutrient budgets at farm level, just as Pete Ritchie was describing. Having that as a policy that is supported, rather than as an ambition, which is what a lot of the stuff about nitrogen in the climate change plan at the moment comes across as, would signal the urgency of the matter.

We cannot be sitting here in 10 years' time saying, "Agriculture's still not really done much"—we do not have that luxury in respect of either climate change globally or the action that we need to take in Scotland. We need to give the climate change plan for agriculture more teeth, and we need to go from the target of an 8 per cent reduction by 2032 to something more like the 20 per cent reduction target that the Committee on Climate Change recommends.

John Scott: Do you agree that there is an opportunity, as Andrew Midgley said, to portray the good things that agriculture can do? From listening to all that has been said this morning, would you agree that there is a need to work collaboratively, through organisations such as SAOS and SEFARI, to bring that about? The veterinary term "synergistically" has been used—when you work together, the total is greater than the sum of the parts if each of you is working in an individual silo.

Professor Reay: I reiterate that we cannot make the mistake that Denmark made. Everyone needs to be brought together, and we are well placed to do that. There is some great expertise in Scotland, in the scientific and academic communities and right the way through to practice on the ground, so that opportunity is there for us.

Pete Ritchie: An advisory service that is proactive, comprehensive and fit for purpose can join up some of the stuff that, as scientists are finding it out, we can practise on the ground. At the moment, the advisory service is not quite cutting it, in my view.

John Scott: I could not agree more.

Patrick Krause: I agree with the synergy aspect of this. We have a climate change plan, an environmental strategy, a biodiversity strategy and a woodland expansion plan, and we are going to see an Agriculture Bill. I would add to that list one more thing, which is much more holistic: I urge the committee to support the introduction of the good food nation bill, which encompasses a lot of this and demonstrates that synergetic approach.

Professor Wall: I echo the points already made and add that a lot of what we have talked about today concerns mitigation on a farm. John Scott has mentioned how we can work together synergistically across farms and across regions to tackle some of the big issues, particularly the complexities around nitrogen. There is also a supply chain, and Katy Dickson and Patrick Krause have referred to the range of acts that are trying to work together. We are talking about complicated interactions and we are trying to get farmers to understand in a world of fast-moving data and information. Although knowledge transfer and exchange have been useful in the past, we may need to take a new educational approach to the issue and link in with continued lifelong learning. The problem is big and it needs that sort of level of collaboration to work.

The Convener: We have run out of time, I am afraid. I will let Andrew Midgley make a very brief point.

Andrew Midgley: We mentioned origin green earlier. Farmers are running businesses. If we can speak their language and make an opportunity of the drive in that direction, the Government can lead the way.

The Convener: I thank all the witnesses for their evidence, which has been extremely valuable. We could probably have gone on for another 90 minutes, but they will be glad to hear that this part of the meeting has now come to a close.

10:59

Meeting suspended.

11:08

On resuming—

The Convener: I am delighted to welcome our second panel, which will look at freight transport in the context of the Climate Change (Emissions Reduction Targets) (Scotland) Bill. We are joined by Dr Andy Jefferson, programme director at Sustainable Aviation; Rebecca Kite, environment policy manager at the Freight Transport Association; and Martin Reid, policy director at the Road Haulage Association. Good morning.

I will start by asking a similar question to the one that we asked our agriculture witnesses earlier. How well have approaches encouraging low-carbon freight transport worked to date? What has worked? What has not worked?

Martin Reid (Road Haulage Association): We must acknowledge the different stance that the Scottish Government has taken to low-emission zones. The lead-in time for the introduction of low-emission zones in Scotland has been far more sympathetic to the industry than it has been south of the border. In our view, it is incredibly helpful to have a reasonable lead-in time, particularly as the technology tries to catch up with the requirements for the road haulage industry. At the moment, there is no retrofit option that is accredited under the clean vehicle retrofit accreditation scheme, although such options are starting to filter in. We appreciate the additional time that has been allowed to enable the technology for our industry to catch up so that we can get to where we need to be. The reaction of some of the cities south of the border has left far shorter lead-in times.

The Convener: Does anyone else want to point to things that have worked or not worked?

Dr Andy Jefferson (Sustainable Aviation): Obviously, I look at the issue from an aviation perspective rather than a road freight perspective. It is extremely helpful to have long-term targets and ambitions from the point of view of giving a signal to the industry on the need to reduce carbon emissions. The aviation sector has the long-term goal of halving the 2005 level of carbon emissions by 2050. We have had that goal for a while, and we are making good progress. In the past 10 years, we have delivered aviation growth across the UK, including in Scotland, without increasing carbon emissions, which is a step in the right direction. We have delivered that through an improvement of around 12 per cent in the fuel efficiency of aircraft and flying. That has enabled growth without increasing carbon emissions. Going forward, we have plans for the use of sustainable aviation fuels and aerospace technology innovations in engines and airframes, which we can talk about in more detail later.

Having a clear long-term target and ambition is extremely helpful in sending a signal to the industry and providing time for investment in long-term technology solutions, as well as the shorter-term operational changes.

The Convener: Has that process been driven by your sector?

Dr Jefferson: It has involved a combination of the Climate Change (Scotland) Act 2009, the UK position, the EU position and the international position. The aviation industry operates around the globe, so we are influenced by a variety of signals.

Having consistent signals that all say that there is a need to decarbonise—the industry completely agrees that that is the case—is helpful in enabling the industry to build in the right investment plans and to work out how to operate the airspace more efficiently and how to invest in new technologies to decarbonise.

The Convener: Both of you have mentioned things that the Government has done, but is there consumer demand—or client demand—for such measures? Many people like to talk about air miles when it comes to their food.

Dr Jefferson: Absolutely—civil society is increasingly concerned about climate change. The membership of Sustainable Aviation represents airlines, airports, manufacturers and air traffic controllers in the UK, and we are all committed to playing our part in addressing climate change. Aviation contributes around 12 per cent of emissions at UK level and 2 per cent at a global level. Our role is to minimise that and to work across the industry on a range of measures to achieve it.

The signal with regard to people buying tickets to fly is probably different from that with regard to the purchasing of a product that has been air freighted and what the carbon footprint, in air miles terms, of that product is. Those two things are slightly different, so the signals are slightly mixed when it comes to what the aviation industry gets back from consumers. We are certainly committed to decarbonising—that is locked into the system. If anything, the society perspective is helping us to do that and to put pressure on to accelerate reductions.

Rebecca Kite (Freight Transport Association): I manage the logistics emissions reduction scheme, which is a voluntary, industry-led initiative that focuses on recording and reporting the carbon footprint of its members. It is now in its eighth year, and it has consistently reduced that carbon footprint. It has exceeded the efforts of the industry as a whole. It has demonstrated things that have worked, such as driver fuel efficiency training, making sure that tyres are properly inflated, fitting aerodynamics to trucks, the trialling of alternative fuels and the use of kinetic energy recovery systems. Those measures have consistently produced successful results.

As well as recording the carbon footprint of its members, the scheme supports them—it has its own website, which provides members with information and guidance on how to reduce their emissions.

11:15

The Convener: All three of you are talking about things that your own industry or sector is doing. Do you look to other countries for good practice? Could Scotland be looking to other countries for good practice in terms of Government initiatives?

Dr Jefferson: From an aviation point of view, in the UK we tend to be at the forefront of a lot of the developments. Certainly, through the aviation sector's sustainable aviation coalition, the UK was the first country to produce a carbon road map for aviation emissions and set out its blueprint for how it wants to halve net carbon emissions from aviation by 2050. That led to European and global conversations to develop similar plans.

We have been at the forefront of that and we are also doing work around sustainable aviation fuels, which are fuels that will deliver a 60 per cent life-cycle carbon saving over using fossil-based jet fuel. There is work that is looking at, for example, converting landfill waste and waste-gas emissions from industrial processes into jet fuel. Both schemes are working with projects that are supported by fuel innovation companies.

The Convener: A couple of members are having difficulty hearing you. Perhaps you could adjust your microphone and speak a little more slowly.

Dr Jefferson: Sorry. I was saying that the sustainable aviation fuel market is in its infancy, but we have done a lot of work in the past four years and are pretty well at the forefront of the conversation about how we incentivise those fuels to be produced. Clearly, as an aviation industry coalition, we are users but not makers of fuel, so our challenge is how we work with people who can make the fuel and work with Governments to generate the right policy environment and the signals so that we see those sorts of fuels being developed here in Scotland and in the UK.

There is more work to be done, but we have two good examples of progress. First, there was the inclusion of sustainable aviation fuels in the renewable transport fuel obligation, which the UK Government did at the end of last year and the beginning of this year. The second example was the establishment of a partnership group between Government and industry, so we have a sustainable aviation fuels special interest group that is working with Innovate UK and ourselves on how we bring together the different players—the fuel producers, the sustainable fuel producers and the industry—and deal with the challenge of how we scale up the development of those innovation technologies and create the fuels in volumes that will make that difference.

Our forecasts show that by 2050 we could be reducing carbon from UK aviation by 24 per cent by introducing those fuels, so it is a significant opportunity and probably the most significant opportunity for long-haul flights. For short-haul flights, the aerospace industry is heavily involved with the Aerospace Technology Institute, which again is a UK Government-industry partnership that is looking at future technologies.

A lot of work at the moment is looking at the electrification of aviation, which is really interesting and has exploded to come on in leaps and bounds over the past few years. I think that we will see some steps forward from where we are today to hybrid types of aircraft or hybrid electric aircraft, certainly on the short-haul flights to and from Europe. At the moment, there are challenges because of the weight of batteries required for long-haul flights, which is where sustainable aviation fuels can be a real opportunity.

The technology innovation that has happened up to now with companies such as Rolls-Royce, Airbus and Boeing means that we have reduced the carbon intensity of aviation substantially, so that the target going forward is a 75 per cent reduction in carbon from new technology by 2050, compared to the 2000 level. There are significant further opportunities.

From a Government point of view, whether that be the Scottish Government, the UK Government or others, it is about how we maximise the innovation opportunities and support them with the right policy signals to secure the investments. Obviously, we are talking about billions of pounds-worth of investment over time to create the new technologies. That is what the aerospace growth partnership between the UK Government and the UK aerospace industry is all about. I think that there are further opportunities for Scotland in that.

Stewart Stevenson: I am a qualified pilot, albeit a private pilot with various ratings.

We are trying to focus on air freight rather than passenger transport, and a lot of what we are hearing from you is about the industry as a whole. At Edinburgh airport, there is barely a freight airframe that is less than 10 years old, and a lot of them are more than 20 years old. Freight is using that old technology and a lot of the discourse here does not really apply to it. What is the aviation freight industry doing to improve things? I have seen no evidence of it re-engineing or changing its aerodynamic profile by using winglets and so on. What is the air freight industry doing? It is using some pretty old and relatively fuel-inefficient kit, is it not?

Dr Jefferson: First, I apologise. I had not realised that we would be looking purely at air freight today, so I am probably not as well briefed on that as I could be. However, I am happy to take the point away and provide some evidence after the meeting, if that would help the committee.

I can say that fuel is the second biggest cost for an airline, whether it is a cargo or a passenger airline. It should be borne in mind that a lot of freight gets carried in the holds of passenger aircraft. Fuel is the second biggest bill, so airlines are focused on the need to minimise it. They are constantly looking at how they can operate the aircraft as efficiently as possible by flying as short a route as possible between A and B, for example, although that raises the challenge of airspace change and modernisation, which I understand is an on-going challenge up here in Scotland as much as it is across the rest of the UK. Airspace modernisation certainly provides the opportunity to reduce UK aviation carbon emissions by 10 per cent by 2050.

From my limited understanding of cargo airline-specific operations, I see a couple of incentives. There is the cost of fuel and, in the future, all airlines across the globe will take part in the global carbon offset scheme that was established through the International Civil Aviation Organization. That scheme comes into operation in 2021 and airlines will have to monitor, report on and verify their emissions starting on 1 January next year to create a baseline for the system. The system is designed to ensure that there is no net increase in carbon emissions from aviation from 2020 onwards. Any additional emissions that an airline creates above its 2020 level will have to be paid for through an offset scheme.

I explained that because it will put additional costs on top of operating costs on to a freight airline as much as it will on to a passenger airline. That will incentivise the need to reduce. Those schemes are on top of the existing European emissions trading scheme, which also applies a carbon cost to operating.

There are incentives for cargo airlines as much as passenger airlines to reduce emissions. There are signals there, but could they be stronger or more positive? Could we be incentivising those airlines to use more sustainable fuels? I am sure that we could.

Finlay Carson: You have already covered some of the ways that you will change the transport sector. How will each of your sectors have to change to achieve a 90 per cent reduction and a net zero target? What specific interventions will you make to make that a possibility?

Martin Reid: There has been a real increase in telematics and how we record data on efficiencies for trucks. The telematics allow us to analyse braking. As part of the education process, we have come to understand the effects of harsh braking

on the environment. We also understand the effects of tyre wear and degradation. Telematics is able to help us to record that side of things. For example, when a transport manager is reading a printout, they can tell whether somebody has hit the brakes very hard 300 miles away because they can see the data. They can ask what happened, whether the driver was going too fast, whether something happened that caused the driver to brake harshly, and so on. That is an example of the on-going conversations that happen every day and of the part that telematics plays.

We will, however, be beholden to the new technologies that are coming in. Rebecca Kite mentioned that a number of trials are going on of a number of different fuel sets, but the trials are small and the data is new.

Information on cost is in its infancy. The Malcolm Group rolled out a new gas truck last Friday, 9 November, at Transport News's Scottish Rewards. It will go on the road next month, but the Malcolm Group still does not know the cost. The manufacturer wants the group to trial the truck and see how it gets on and then talk money after that. That is the grey area that surrounds things. It is not necessarily helpful, but that is where we are. There is no point in pretending otherwise.

Saying what would be needed to make the difference between 90 per cent and net zero would mean throwing a finger in the air. We are at a stage where we cannot predict, because of the lack of technological back up, although we have the industry's goodwill to do it.

Dr Jefferson talked about cost. Fuel costs are massive for a haulier. We operate in an industry where margins are typically 2 to 3 per cent. A haulier can wait 60 to 90 days to get paid for a job, but the fuel bill will come in on seven days. Hauliers already bear an unreasonable amount of risk within the supply chain. When swingeing changes are made, they have to be backed by a sensible economic process that hauliers can see the benefit of.

In answer to the question, we do not know what the difference between a 90 per cent reduction and a 100 per cent reduction will be. We hope that technology will have caught up by that point and that we will have had robust data that will convince hauliers to take that leap. Any Government help would be most welcome, so if the committee feels like getting the cheque books out and helping us to upgrade, we would be delighted.

The Convener: I have a small question about telematics. Are they linked to hauliers' insurance? Are there benefits in the data being put to insurers?

Martin Reid: Insurers are getting increasingly observant about everything that goes on.

The Convener: Is that another potential incentive?

Martin Reid: Absolutely. Even more than the insurers, it is also a requirement for the traffic commissioner for Scotland's office.

The road haulage industry is more heavily regulated than most others, including the aviation industry. The traffic commissioner has the power to put sanctions on an operator's licence or remove an operator's licence if the promises made in the application are not upheld. The collection and production of data are part of those promises.

Finlay Carson: I think that you are suggesting that there is not enough incentive or encouragement from the Government to go that bit further. Are there policies to recognise what the sector is doing to tackle climate change? Are you being rewarded for the work that you have done, or should there be policy changes to recognise that work?

Martin Reid: It is difficult to say whether we are being rewarded or not. I do not think that we are. Virtue is its own reward in this case. We are all trying to get to a point where carbon emissions are down.

I mentioned the low-emission zones earlier. Our industry is moving apace towards Euro 6 engines. In 2017, Euro 6 engines represented about 36 per cent of the fleet. In 2019, that is expected to be 50 per cent. By the time that the low-emission zone comes in in Glasgow, it should be about 78 per cent. That is through natural churn—the average life of a truck is 10 to 12 years. As processes move on, trucks with Euro 6 engines come into the second-hand market.

However, putting the onus on Euro 6, which is still diesel and therefore fossil-fuel powered, in one sense takes us away from the net zero carbon side of things. It does, however, allow more leeway so that the truck manufacturers can catch up and get us to the point at which the investment in technology can help.

John Scott: Is there an opportunity for the industries that you represent, as well as the marine industry, which is not represented today, to encourage the development of carbon-reducing fuels if you together say loudly and clearly to the fuel companies that you want that? I dare say that you are all doing that individually, but is there an opportunity to make more of that pressure on the oil companies?

11:30

Martin Reid: Yes, there will be. However, at the end of the day, the oil companies have to sell oil, so they will do everything that they can to ensure that their products are what is required moving forward. I guess that, given the different grades that we require, we each look after our own side of things—it is not a case of "never the twain shall meet", although there are divergent interests—but I certainly have no objections to that suggestion.

Dr Jefferson: Such opportunities probably exist. That is something to take away and have a think about.

When Sustainable Aviation developed the sustainable aviation fuels road map in 2014, there were no big oil companies talking to us about the initiatives that we were looking at, such as turning landfill waste or waste gas emissions into jet fuel. However, we now have two projects—one with British Airways and one with Virgin Atlantic—and both Shell and BP are involved in those, so things have moved on at quite a pace in four years.

The sustainable aviation fuel production facilities that we are looking at could potentially co-process—they could produce jet fuel and biodiesel or some other form of fuel. There are such opportunities. In the past few years, we have been understanding the technology innovation opportunities and trying to support and nurture those to a commercial scale by upping production. We are hopeful that we will see sustainable fuel production plants in the UK in 2020, if not before then.

Claudia Beamish: I want to explore a bit more the issue of transformational change to reduce emissions in the freight transport sector, perhaps through modal shift from road to rail or to cycles for small deliveries in cities in order to minimise heavy goods vehicle deliveries. We have touched on new technologies, but could we hear from each of you on that issue? I will then ask a supplementary question about research and support.

Dr Jefferson: It is probably harder to do modal shift for air freight, certainly with stuff that comes from Africa or further afield. There is a small marginal opportunity to look at rail versus air on the UK domestic scale, and I think that the Committee on Climate Change is going to look at that. It is planning an update on its aviation carbon report in quarter 1 of next year, and it will look at that issue. Our view has always been that, broadly speaking, there are limited opportunities to switch from air freight to ground-based transport.

That said, a lot of work is being done on urban air mobility and using larger versions of drones to deliver express freight parcels and things like that. If those can be delivered using electric sources or renewable energy, that will obviously have the potential to reduce emissions. That is an interesting area that is still in its infancy.

Rebecca Kite: In the scheme that I mentioned, we have awards, and we find that quite a few members are utilising mode shift where they can. We have figures on the carbon that they have saved—I do not have those to hand, but I can send them to the committee. However, we should be wary of reducing the number of heavy goods vehicles that are making deliveries. That issue is coming up a lot, especially as local authorities are considering clean air zones and introducing consolidation centres to break down the contents of big vehicles and put them on smaller vehicles. That has the potential to increase emissions, because it could increase congestion.

Claudia Beamish: Surely, that depends on the fuel that is used. If they were electric vehicles, it would not increase emissions, would it?

Rebecca Kite: But there will still be other traffic on the road, so—

Claudia Beamish: I am asking you about freight. You said that emissions could be increased, but could emissions not be reduced if electric vehicles were used? I have seen how, in other cities—in France, for instance—only small electric vans are allowed to go through certain barriers.

Rebecca Kite: Even if there were zero emissions from the tailpipe, there would still be tyre-wear, brake-wear and road-wear emissions. If you break it down, a 44-tonne truck can carry 25 vans' worth of goods. Those 25 vans might be zero-emission vehicles, but they might be on the road along with other vehicles that might not be producing zero emissions, and increasing congestion would increase emissions.

Martin Reid: I echo those comments. At the moment, 90 per cent of everything that you wear, eat, drink or sit on is in the back of a lorry at some point. An equally sensible debate to have alongside that on modal shift is on the requirement for a fully integrated transport network. To encourage modal shift, where that is appropriate, you need to provide alternatives, and I do not think that the infrastructure is there yet.

A number of our members use rail and road, but we should remember that, although road can survive without rail, rail cannot survive without road—the same goes for the aviation industry, the ports and so on. Lorries take things to a port from a port, to an airport from an airport and to a train from a train. All those things are going to spend a bit of time on the back of a lorry. To make that system as seamless as possible requires a fully integrated transport network, not just a modal shift.

The Convener: We have only 15 minutes left of this evidence session, so I must ask for short questions and reasonably tight answers.

Mark Ruskell: Could a technological step-change in aviation be coming? I was interested to see a picture of the Varialift airship, which is currently being developed in France. Could that kind of technology make current air-freight technology redundant?

Dr Jefferson: I am not familiar with the airship idea.

Mark Ruskell: It is being developed in France, and it is 12 storeys high and goes at 280mph. It seems like the stuff of the future to me, but it is a real thing.

Dr Jefferson: Absolutely. A lot in the technology space offers opportunities, but sustainable aviation is paying more attention to how we transform the traditional tube-and-wing concept of an aircraft into something much more efficient than it is today. A series of steps can be taken. In our carbon road map, we have identified a 40 per cent or so carbon reduction potential through the introduction of new technology and the introduction of those new aeroplanes into UK aviation by 2050. Moreover, when we did that work, we excluded electrification, hybrid electric vehicles and other such ideas.

It is still early days—as I have said, the Committee on Climate Change will look at the issue in the first quarter of next year—but significant carbon savings can be made from moving to electrification, with hybrid as the first step for short-haul flights and sustainable fuels for longer hauls. A range of things out there could make a big change.

The Convener: I apologise to the members whom I have not been able to bring in, but we must move on to our next theme, which is consumer behaviour.

John Scott: Is it realistic or likely that consumers will change their behaviour by either flying less or purchasing fewer goods that have been transported long distances by road, air or rail? How do you see consumer behaviour driving change in your industries?

Dr Jefferson: I will answer that question as briefly as I can from an aviation perspective. At this stage, we are seeing a drive more from corporates and investors in aviation companies and less from the consumer. The biggest challenge will come when carbon pricing comes into play through carbon offsetting and the international carbon scheme. That could impact on demand, but, at the moment, we are working to the Government's aviation forecast, which assumes around a doubling in air travel between 2010 and 2050. Our analysis is that, if we can deliver that additional growth with no additional carbon in absolute terms, we can reduce net carbon emissions by 50 per cent by 2050 through carbon offsetting.

Martin Reid: The difficulty is the consumer need to have everything in 24 hours. People have a couple of glasses of wine, go on eBay and order something from eastern Europe and it arrives the next day. Stopping such consumer expectations would be difficult, but Brexit might do that for us anyway.

The Convener: I recently heard on the radio about the Chinese black Friday—I cannot remember what it is called. People are using that as a new opportunity to go online and buy electronic goods. Again, the temptation to do that makes achieving our goals more difficult.

Mark Ruskell has questions about the assessment of the costs and benefits of mitigating climate change.

Mark Ruskell: That is my question really. Have you done any short-term and long-term analysis of those costs? I know that it is difficult to do that because, as you have said, you cannot predict today what technology we will be using in 25 years' time. What assessments have you done at this time of the economic costs of mitigation?

Martin Reid: Those costs are not available yet. Companies are doing individual trials, but the findings are not public. In terms of our being able to do anything along those lines, the cost benefit analysis of moving things forward is very limited.

I return to my earlier point about the margins that we are operating to. Finding any efficiencies whatsoever is very welcome—if there is the smallest hint that mitigation is working financially, people will jump at the idea.

We must remember that the amount of R and D that truck manufacturers are doing is probably not at the level that we want it to be at. They are not selling trucks as much as they used to—the number of truck registrations is going down. The gap between the costs of Euro 5 and Euro 6 and of trading up from one to the other is massive, partly because of the requirements of the low-emission zones. Therefore, even for adopters, the barriers to market entry are bigger than they used to be.

Dr Jefferson: For aviation, there are a series of costs, including the technology investment costs in making a new aeroplane and a new engine, which amount to billions of pounds. As I have described, that works through the aerospace growth partnership between the UK Government and the UK aerospace industry, whereby there is a joint investment and commitment to the vision of the 75

per cent reduction in carbon from aviation technology.

On top of that, the airlines have incentives to minimise fuel costs. Our challenge is that sustainable fuels cost more than fossil-based fuel does. Consequently, it was important to include sustainable aviation fuels in the renewable transport fuel obligations, because that helps to level the playing field for the price.

The third big area for us is airspace modernisation, which enables more direct and therefore efficient flights.

Those are the issues that we are focused on. The cost of fuel and, increasingly, the cost of carbon offsets will act as incentives to drive the investment in new technology.

The Convener: Finlay Carson has questions to do with buy-in.

Finlay Carson: How can we get the Scottish Government to secure buy-in from the various transport sectors for action to meet climate change targets? I touched on the issue of policy incentives, but how can each sector get the Government to do more to get you to buy into climate change adaptation and mitigation?

11:45

Martin Reid: For us, a major issue is the need to remove, in some way, the financial barriers to upgrading or to help and support. The ideal scenario would be a scrappage scheme, but that would involve an awful lot of money, and we know that that is not likely to happen. Perhaps grants could be made available, particularly to small and medium-sized enterprises that want to engage. The larger companies will have their own R and D and their own natural churn that they operate to, whereas for the smaller SMEs—the guys who are harder to engage with—something along the lines of a support network to try the new fuels and even to upgrade to Euro 6 would be very welcome in the meantime.

Rebecca Kite: It is also important to give industry certainty, as a big investment is involved and it needs to trust that the technology will work. The UK Government recently released its strategy "The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy". The strategy will define what is classed as an ultra-low-emission truck. It is hoped that that definition will give manufacturers something to work towards, which will provide vehicles for operators to purchase. It is also running gas trials to analyse whether there are any emission savings to be had by going over to gas.

Dr Jefferson: I echo the need for a long-term signal. That is important for long-term investment in new aircraft and engines.

There are a couple of things to say about aviation specifically. Airspace change can offer carbon reductions, but that has been delayed because of concerns about noise around airports and how the changes would affect people. It is important that we find the right solution to the noise and carbon issues as quickly as we can and that we see the bigger benefits that airspace modernisation will bring. The Scottish Government can play a role in doing that in the debates in Scotland.

It is also important to avoid policy measures that could create unintended consequences, such as carbon leakage. A carbon tax on aviation, for instance, could create problems if a greater cost was created for operating flights from Scotland compared with the cost of operating flights from England, Europe or somewhere else. There is a real risk that we could create a disconnect in what we want to achieve, as people would fly to Europe by getting a cheaper flight rather than getting a direct flight from Scotland.

Martin Reid: We cannot have a one-size-fits-all solution. That is the other issue that I would look to the Government to get a handle on. Regardless of the technologies that are likely to come, it will be some time—if it ever happens—before there are power outages for electric batteries for heavy haulage, for example. That is way in the distance and probably beyond the horizon of what will happen in my lifetime. It is not a simple case of saying that all engines need to be this by that date; there must be a greater understanding of the practicalities and problems in particular parts of road haulage and, I am sure, in aviation as well.

The Convener: We will move on to questions from Richard Lyle. I apologise to Finlay Carson, but we are running out of time.

Richard Lyle: Christmas is coming fast, and you guys are already delivering Christmas goods to shops. What is in your letter to Santa? How should changes to freight transport be prioritised in the next climate change plan?

Martin Reid: That is a good question.

Richard Lyle: I thought that you would like it.

Martin Reid: I encourage a sensible and pragmatic approach rather than a knee-jerk reaction. As Rebecca Kite pointed out, having something to aim for and a realistic timescale is absolutely essential for us. As I have said, we are talking about a massive part of the UK economy. The way that freight moves is absolutely essential for us, and it is essential that hauliers come along with the message, as it is much easier to pull

along somebody who is standing side by side than it is to drag them when they do not want to go.

The message has to be positive. I sat in on the discussions this morning, and there is a lot to be learned from them. We need to accentuate the positives along with the negatives, and we must ensure that there is something achievable for everybody and praise people who are making the effort to do something.

That would be my wee message to Santa as we move forward.

Dr Jefferson: From an aviation perspective, a couple of things are important. We need to have a long-term signal on the carbon ambition that we are all aiming for. We are pretty clear on that, but we would be keen to work with the committee to explain where we are at and what we are trying to achieve, and to look at how the policy signals can be aligned to help us achieve that ambition as quickly as we can. That applies to sustainable aviation fuel production, the technology revolution and airspace modernisation. In aviation, quite a lot of investment will come through the carbon offset market, so there is a question about the opportunities that that might offer Scotland.

The Convener: To anyone who is watching, I point out that Santa delivers his presents by reindeer and sleigh.

Martin Reid: Coca-Cola uses a big lorry.

The Convener: Yes.

I am sorry that I need to bring the session to a close, but we have run out of time. I thank the witnesses for giving their time this morning.

11:50

Meeting suspended.

11:53

On resuming—

The Convener: I am delighted to welcome our third panel, which will look at active and public transport in the context of the Climate Change (Emissions Reduction Targets) (Scotland) Bill. We are joined by Ian Findlay, the chief officer of Paths for All; Keith Irving, the chief executive of Cycling Scotland; Andy Cope, the director of the insight, research and monitoring unit at Sustrans; Bruce Kiloh, the head of policy and planning at Strathclyde partnership for transport; and Jess Pepper, enterprise manager for Transform Scotland.

What work has the Government done so far that has helped with active travel and public transport, and what has worked not so well?

Ian Findlay (Paths for All): The doubling of the active travel budget has been extremely welcome and has worked well. There is greater integration between policy areas—in particular, between public health and transport. Active travel being seen as a health prescription has been a very welcome addition. Using a combination of infrastructure and behaviour-change measures to deliver active travel and sustainable travel outcomes has also worked really well.

On what is not working quite so well, we need to accelerate the modal shift away from the private motor car to walking and cycling for short journeys, and to public transport for longer journeys. The statistics show that the figures are fairly static. One of the key things is to find ways of making active and sustainable travel the natural and first choice for all of us—walking and cycling for very short journeys and public transport for longer journeys.

Bus travel is significant because it accounts for about 76 per cent of all public transport journeys. However, in the context of the Transport (Scotland) Bill and the evidence that has been taken on it, we see that bus patronage is going down, while fares are going up. It is important to tackle that issue. It is also important to consider the first mile and the last mile in the context of public transport. The first and last miles of most public transport journeys are either walked or cycled.

Finally, we need even more links between planning and transport policy. Planning can either frustrate active and sustainable travel or it can be a big driver for it. Through the Planning (Scotland) Bill, there is an opportunity to ensure that planning helps to deliver active and sustainable travel outcomes.

The Convener: Do other panellists have points to make on what has worked, what has not worked and what could work better?

Keith Irving (Cycling Scotland): There are more people cycling and there are workplaces, campuses and areas of cities and towns in Scotland where approaching one in 10 journeys is made by bike. For example, with the new Borders railway, 14 per cent of passengers cycle to get to Eskbank station and 60 per cent walk or cycle to get to Newtongrange station. Investment is delivering results in those areas. It is also clear that Edinburgh and Glasgow in particular are now making major investments in cycling and are seeing an increase in its modal share as a result. Progress is being made, but clearly it needs to continue over a much longer timeframe, because major behaviour change is required in order to meet the climate change aspirations.

Bruce Kiloh (Strathclyde Partnership for Transport): There is a bit of a mixed picture. Rail patronage has gone up and we have seen the benefit from the significant investment in rail. However, bus patronage, in particular in the west of Scotland—SPT's area—has gone down significantly by more than 60 million journeys over the past 10 years, which is 27 per cent. There is therefore good and bad news.

Again, as the other panellists have said, there has been progress in integration and there is greater recognition of transport's contribution to economic growth. However, members are perhaps aware that in 2015 transport overtook energy production as the biggest carbon emitter, so there is a mixed bag in that regard, as well. As Ian Findlay said, the contribution of transport and active travel to physical and mental health is now mainstream. Generally, investment in cycling and active travel over the past seven to 10 years has seen a welcome and massive step change, and we are already seeing the results.

There has been good investment by the Scottish Government and SPT, and by the operators in terms of vehicles, disruptive technologies, mobilities of service and ultra-low emission vehicles—the innovative side of transport. However, there needs to be more investment because we still have a long way to go if we are to achieve the bill's climate change targets.

12:00

The Convener: You said that bus travel has gone down and rail travel has gone up. What are the reasons for that?

Bruce Kiloh: There is a range of reasons. An excellent report that was recently done by KPMG for the Confederation of Passenger Transport looked at the reasons for the significant decrease in bus travel. I mentioned the west of Scotland, because that is where the vast majority of the decrease has happened. In the Lothians, there has been a slight downturn over the past year or two, but over the period that I am talking about, there was a reduction of 27 per cent, or 60 million journeys, in the west of Scotland while—if I remember correctly—bus travel grew by about five million journeys in the Lothians.

As is so often the case in Scotland, there is no one-size-fits-all reason. The decrease has been partly societal. Another reason is that the west of Scotland has a fantastic rail network—it has the biggest suburban rail network outside London, with more than 180 stations and fantastic penetration. For example, it takes only an hour to get from Ayr to Glasgow Central.

The Convener: Edinburgh has a fantastic and very well used bus service.

Bruce Kiloh: Indeed. That service is a great offer. There is no denying that Lothian Buses is one of our model bus companies and provides a best-practice example for the UK. It also has one of the youngest bus fleets in the country.

Someone talked earlier about integration of planning and transport. We have a long way to go with regard to giving priority to public transport on the roads, and with regard to parking and so on. I could spend the rest of the day talking about the reasons for the situation, but those are some.

Jess Pepper (Transform Scotland): What works well is a good service in which investment has been made—I include the Borders railway and the bus service in the city of Edinburgh—which has good connectivity, is reliable and accessible, and which people want to use. As a result of that, numbers grow and are sustained. I agree with the other panellists.

The Germans use the useful phrase "avoid, shift, improve"; Government programmes concentrate mainly on the "improve" aspect with regard to efficiency, electric vehicles and so on, but what we need is a move to "avoid" and "shift". We are used to that sort of thing in waste reduction, with the reduce, reuse and recycle approach being culturally normal—we do not just go to the bottom rung of recycling. As a nation, we need to think about the same hierarchy with regard to travel and, in a cultural way, ask ourselves, "Do I need to make that journey? In what other way can I make it? Can I make it in a way that is good for my health? If I can't avoid making the journey, how do I shift to another mode? What mode is the best one to use?" We should by all means improve modes, but we need to think through all those things at the same time.

Andy Cope (Sustrans): I will respond to the opening question from the perspective of active travel. Achieving the potential of active travel depends on better options being offered and better choices being encouraged. That is partly about getting the package of measures right. That will need investment, but in the context of climate change—I am sure that the committee has heard this message a lot—it will be cheaper to make that investment now than it might be later.

The key achievement has been to double Transport Scotland's investment in active travel. That has been incredible, but it is worth noting that Sustrans administers part of that Transport Scotland funding, and it has been well oversubscribed this time round. There is interest among local authorities in getting the infrastructure right.

That said, we probably need to make even more investment to realise the full potential of active travel. We need only compare what has been

invested in Scotland with the Greater Manchester plan that Chris Boardman has put forward and which is worth £1.5 billion over 10 years. That is considerably more than the investment that is being made in Scotland.

We also need to strike a better balance between capital and revenue. A lot of the investment at the moment is in the capital side; we absolutely need to get the environment right, but we must also be able to encourage support for people to change their behaviours. As one of my fellow panellists has already pointed out, investment needs to be sustained in the long term—we need to know that it will be there for years to come. The three-year window is a big improvement on the one-year window that applied in the distant past, and it would be useful to know that the upcoming time span for investment was longer.

That must be in tandem with better traffic demand management. There is almost a juxtaposition of active travel and private car travel, and we need to get the balance right so that we encourage better choices through measures that not only support active travel but address travel demand issues.

Claudia Beamish: The witnesses have touched on quite a lot of the issues that I wanted to raise. What is your vision for achieving, in the more distant future, the transformational change that we need through active travel and public transport to meet our 90 per cent emissions reduction target—perhaps we will come to net zero emissions later—and up the game?

Ian Findlay: On one level, the answer is simple. The transport hierarchy puts walking and cycling first, followed by public transport and then use of private vehicles. My vision is that we would put in place policies, procedures and investment to give everyone the choice to move up the hierarchy. To build on Jess Pepper's point, we should provide choice not just to avoid bad decisions but to encourage the best decisions. The transport hierarchy provides a good template for policies, decision making and investment to move our choices up the hierarchy.

Jess Pepper: There is a great opportunity. The Government could set a strong framework for that, invest in it and invest in the infrastructure to deliver it. As we have heard a number of times, industry and the public sector are keen to have such certainty, so that they can invest, innovate and change.

I will give an example of an ambition that we might aim for. The climate change plan aims for a policy outcome of increasing to 50 per cent by 2032 the proportion of the Scottish bus fleet that is low-emission vehicles. The projection for the world's buses is that about 47 per cent will be electric by 2025, and 13 cities internationally are committed to buying only zero-emission buses from 2025—Shanghai and Shenzhen are already buying only such buses. That action involves 80 million people and 60,000 buses. If we are asking whether we should lead and be ahead of the curve or wait and follow others, we might be mindful that Scotland is home to two international bus operator companies. Scotland also makes buses and is a leader in producing clean electricity, so there are huge opportunities not only for our national bus fleet but for international activity in relation to buses to gain economic advantages.

We should not neglect the multiple benefits that are sometimes overlooked of bus and other public transport use. It connects with active travel and health, and it gives everybody—people from rural areas and all sorts of areas—the ability to access opportunities for education and jobs. We might aim for an ambition that could improve our society and allow us to take the global opportunity.

Keith Irving: The question was about our vision. I would like everyone aged eight to 80 to be able to cycle independently in their community. That would require a number of things, including a coherent and complete network of dedicated cycling routes in our cities and largest towns; universal access to a bike and to cycle training to enable people to cycle confidently in urban and rural areas; and the long-term horizon that Andy Cope mentioned. Although the aim should be delivered as fast as possible, it would require a long-term commitment over decades, such that it would be unthinkable that the investment programme would not continue year on year.

Bruce Kiloh: The question is timely. You will be aware that the Scottish Government is developing its new national transport strategy and is looking at a new vision and objectives for transport that will set the tone for the next 20 years. For me, the biggest issue that we face is reduction of overreliance on single-occupant car travel. It is the same; we have not managed to break that deadlock. To address that, we need to consider such things as better investment in public transport to make bus, train and subway travel more attractive in order to get people out of their cars. We need to attract people back on to public transport.

Jess Pepper made a point that is important to note, which was that there is probably now greater recognition of the value of public transport to our society. More people access the high street by bus, for example, than by any other mode, including private car, so if you want to improve town centres you should invest in bus travel. The answers are there for you to see.

As Ian Findlay said, the transport hierarchy is there to be followed. It is not rocket science. The

biggest challenge that we face is in doing the things that we know we want to do, to reduce the need to travel and to reduce reliance on the private car in a world in which the demand for and supply of transport are fundamentally changing. Companies such as Uber and Lyft are encouraging people to use cars: that is a challenge that policy makers face for the coming years.

The answer is there in front of you. Our journey and the strategy that we employ will be the challenging part. As far as the national transport strategy is concerned, when the vision is correct and is published, that will set the tone for the future and it must be reflected in the forthcoming strategic transport projects review. That is a point that we have made time and again to Transport Scotland and the Scottish Government. Strategic transport projects are not just big roads, big railways or big bridges: they are also about active travel, including bus travel. As somebody said earlier, about 80 per cent of people in the west of Scotland travel by bus; that is the main public transport mode, so that scale needs to be reflected in future investment.

Mark Ruskell: Those are some interesting and attractive visions of how we might be travelling around in the future, but let us break this down a bit. The bill sets a clear target of 90 per cent reduction for 2050 and there is the opportunity to set a net zero target either for 2050 or for 2040. Let us say that net zero by 2040 is the gold standard. What would need to change to meet that challenging and ambitious target for transport? What would be the one or two things that would have to happen?

Andy Cope: That would need primarily investment in active travel. It is about getting the mix right. Panellists are presenting slightly different aspects of different modes—Sustrans's particular perspective is on active travel, but we very much recognise that there is a public transport element that we need to get right and that there is a role for single-occupancy vehicles—ideally electric vehicles or low-emissions vehicles. You also asked about the vision for the future.

Mark Ruskell: I would like to know what specifically needs to happen, particularly in the next 12 years, given the Intergovernmental Panel on Climate Change's advice, to get us on the trajectory to net zero emissions by 2040.

Andy Cope: The best start to getting us on that trajectory is to invest more heavily in walking and cycling, and in particular to emphasise the behaviour-change element in equal measure with the infrastructure and environment part.

Ian Findlay: What is interesting about active travel is that it is a form of behaviour change that changes one's values. When you think of active travel, the first thing that you have to do is decide to change your behaviour in order to travel in a more active way. In order to do that, you need first to change your values.

I know that the committee has been looking at other ways in which to meet the transport emissions reduction targets as well as the targets on waste, agriculture and so on. Active travel is an efficient way into that. If people choose to travel more actively, they have already changed their value set and thought about their lifestyle in general—about issues such as their health, the local pound and how they purchase things. The value of active travel goes beyond just the value of the walking and cycling; it is in changing the way that people think about how they live. Therefore, it is a means through which to achieve greater climate change emission reductions.

12:15

Bruce Kiloh: To reduce emissions from transport, the most logical thing is to make cleaner technology more widely available. The Government has made inroads into that in relation to electric vehicles, but we need to look across the board. Jess Pepper is absolutely right that, round the world, there is massive investment in workable electric bus systems, which are transporting unbelievable amounts of people. We need to look at that. Scotland has one of the leading bus manufacturers in the world in Alexander Dennis and has two of the main bus operator companies across the globe.

That is the high-level issue; the other thing is complementary measures. We need to ensure that we make change attractive to people. If we want people to leave their cars at home, we need to make the public transport offer more attractive to them.

We also need to look not just from the passenger point of view—we must also look at freight. Demand is increasing as a result of people shopping online. With black Friday coming up, we will see more and more vans on the street, and that number will only increase. It is not within the gift of even the Scottish Parliament or the Scottish Government to change all that, but we need to manage those issues over time. We need complementary measures including bus-priority measures and demand-management measures.

I was recently told that people would never think about taking their car into Edinburgh, but the same is not true for Glasgow. We need to look at that and take a more progressive approach to parking. Glasgow has fantastic motorways surrounding it—they are the arteries, but the heart is in some ways too small to cope with those arteries.

We can do it through technology, but we need to balance that with complementary measures.

Jess Pepper: Investing in public transport and active travel together so that there is sustainable transport will deliver for everybody and provide multiple benefits for society and for the health of our people and our planet.

There is a lot more opportunity to be taken with trains. Thinking about the strategic transport projects review and looking to the future, we need to work with industry to work out what investment is needed and when. Members may be familiar with the class 385 trains that are now running between Edinburgh and Glasgow. That is an electrified service that is attractive, reliable and connected, and it is a joy to ride on it. It is possible to have more electrification in Scotland, and not just on intercity routes. Scotland was a pioneer in battery powered trains in the 1950s. There are opportunities for rural routes as well.

We want to promote that vision, which could be accompanied by a Government-led modal-shift campaign—you would not call it that, but we have had those things in the past. One, which was more confrontational, was called “Learn to Let Go”, which was a negative approach. However, the approach could be about a fabulous transport system that people want to use because it is reliable, high quality and accessible in terms of price and geography. It could be about dispelling some of the assumptions and perceptions that there may have been in the past about using public transport. We could aspire to that clean active vision, which would have so many benefits across the board.

The Convener: Rhoda Grant has questions about how we can break people out of car usage.

Rhoda Grant: Yes—my questions are specifically about rural areas. Most of what we do in relation to cars is about penalising car usage in urban areas. We have fuel tax and low-emission zones and the like in urban areas, but we seem to ignore rural areas totally, because of car dependency. I suppose that people who live in rural areas get the comeback when they have to take their cars into city centres, pay more in fuel duty and the like.

People will often say, “These issues are far too hard to deal with. Let’s deal with the big problem first, and then worry about the other things down the line.” We do not want to drive people from rural areas, but we also need to make them less dependent on cars. How do we do that, given that all the cars that travel long distances and come into towns are from rural areas?

Jess Pepper: Part of the solution will be to invest in the public transport system and in buses; indeed, in some rural areas, it will be a big part. It is really important that we do not neglect these issues in rural areas, because the groups that will be most disadvantaged will be those that are already disadvantaged by poorer bus services—the younger folk, the older people and the people who might not have access to a car and therefore cannot get to health appointments or other opportunities. We need to think about all of that.

Again, the hierarchy will help us think about what solutions might be more appropriate. Perhaps we have to be creative and innovative in our solutions. In days gone by, for example, post buses filled some gaps in bus routes. Investment in buses and the whole public transport system should help, but we might need some creative innovation to fill in other gaps.

The Convener: I am from a rural area, but I do not use the bus, because it does not meet my needs; indeed, a lot of people do not use the service. It is run by a privately operated company, which wants to make money and will look at the overheads involved in running extra buses. How can you encourage more bus use when the service in question is not really a service?

Bruce Kiloh: This is a common issue. I was speaking to someone earlier about the concessionary travel scheme; people in rural areas have their cards, but they are unable to benefit from the policy of free travel for the over-60s, simply because the buses do not exist.

As for commercial operators, we try to look at things purely from the point of view of the bus, not its owner. There is a whole range of issues that operators face in trying to make services work; indeed, we faced that very issue in SPT. That is why we introduced the MyBus service for people in rural areas, who can register for what is demand-responsive transport. We have also utilised community transport by setting up the west of Scotland community transport network, and that has helped in some areas.

However, there is no getting away from the fact that the car will be the solution for some people in rural areas. We just have to accept that, but it moves us into the world that someone else asked about of relying on people transferring to electric vehicles, ensuing that charging points are available and so on.

Scotland is a fantastic place with some brilliant rural areas, but connecting them to the inclusive growth that we all want is going to be a challenge. I am not saying that it will be easy, but there are opportunities out there to deal with the issue.

Keith Irving: The evidence that the committee has taken from Sweden highlighted the huge benefits of electric cars in rural areas, particularly in tackling some cost issues. As Bruce Kiloh has said, the car will be the best option for many

journeys in such areas, but the vast majority of short journeys are made in towns and cities, where there is the greatest potential for cycling and where, if we do not make the investment, we will not meet the zero carbon by 2040 target. This is about the integration of requirements. For example, people need to be able to park near a public transport system and parking needs to be managed so that car journeys finish before they come into towns and cities and do not lead to the kinds of traffic impacts that put people off walking or cycling in those towns and cities.

It all has to be brought together. The fact that there are rural challenges does not prevent action in urban areas to enable zero carbon active travel journeys—the two are not in competition.

Ian Findlay: The rural dimension is close to my heart. I live in Comrie in Perthshire, so all my travel is rural.

People should question whether travel for work is needed in the first place, in this digital age and with agile working. I now work much more than I used to from home or from other places locally that are only a walk or a cycle away. There are technological and workplace solutions to the need for travel.

I agree with Jess Pepper that public transport—bus and train services—is key. We need to find ways of making bus travel more delightful. It is not delightful at the moment in many rural places. It is not seen as an option for lots of people.

The car is inevitable. In places such as Comrie, car clubs and car sharing are becoming more common. The single occupancy private car journey from Comrie across to Langside and down to Dunblane railway station is becoming rarer, because there is an online car-share system within Comrie, through which an individual can link with others. That is another potential solution.

I agree that we must not lose the rural dimension in thinking about those issues.

Jess Pepper: In some cases, it will take dialogue with the industry or service provider to get that positive feedback loop on a service. I live in a rural area, and there was no early service for commuters. A subsidy was provided to support one and eventually there was enough uptake to allow it to be available the whole time. Sometimes it just needs a bit of investment to get a service going again. The buses have to have enough trade to keep them running. If they start to deplete, that runs down the service. A conversation needs to be had with the operators and industry about the potential and how to make the best of it.

The Convener: We will move to questions from Mark Ruskell.

Mark Ruskell: What structural system changes—individual policy measures and investments that the Government can make—may be needed to support this? Are there changes in the way that we plan and run transport systems and the economy that would help?

Bruce Kiloh: Yes. There are huge partnership opportunities, for example through the Transport (Scotland) Bill. There is the option to franchise or have municipal bus companies. There is a range of good and bad points about both those options, but there are opportunities for greater partnership within the bus industry. I am not sure how we make that work, because Scotland is an area of contrasts. There is one main operator in Edinburgh, and three main ones, plus another 47, I think, in Glasgow and the west of Scotland. We are hopeful that that bill will allow more partnership.

We need to look at the work that is being done through the national transport strategy about the roles and responsibilities within transport and how to make those work better. There is a case for change. There are long-held views about better integration between transport and land-use planning. We work closely with Clydeplan, our strategic development planning authority. The Planning (Scotland) Bill is looking at whether those plans should continue.

There has to be greater integration between transport and economic development, and more thinking about how transport can play a supporting role. If we want transformational change in how we approach transport, we need to look at the structures and make sure that we have the right ones in place to enable us to deliver.

12:30

Ian Findlay: I take us back to the transport hierarchy. The structures follow the transport hierarchy. We place a high priority on road building and road maintenance, but we need to prioritise walking and cycling infrastructure maintenance. For example, in putting down salt in the winter, the priority should be to clear snow from walking and cycling routes as well as from roads. I am talking about a change of approach that involves prioritising the walking and cycling infrastructure as well as the roads infrastructure.

The Convener: Stewart Stevenson can ask a very short supplementary question.

Stewart Stevenson: I cannot ask the question if it must be short.

The Convener: Okay.

Keith Irving: I have two brief specific examples. On systematic change, the strategic transport projects review was mentioned earlier. The carbon

impact of decisions has to be embedded into that, so that we end up with walking and cycling as the top priority.

On planning decisions, location is everything, and systemic change is about how we build much-needed houses in the right location. That means that the person who will live in the house will have low-carbon options for getting around, as people are too often car dependent.

Andy Cope: We need better approaches to the economic appraisal of transport. That is part of the systems approach. There are all sorts of weaknesses in there. I will not go into that territory now, as the area is very big, but we need to get it right.

An issue that we have not really mentioned is that travel patterns are changing a lot. We talked about that in the context of the extent to which we commute and travel to work. However, all sorts of changes are happening in urban and rural areas relating to, for example, the extent of delivery. More mature generations are more predisposed to car ownership, and perhaps younger generations look at different ways of getting around. That stuff is all very well documented by the commission on travel demand, which produced a report earlier this year. We have to understand that stuff better to be able to build it into the planning and systems approaches.

The Convener: You have just opened up an area that Richard Lyle will specifically ask about.

Richard Lyle: Most of the witnesses have already touched on this issue, so I will keep my question short. How can individual habitual behaviour be placed at the heart of transport policy, and how can low-carbon habits and lifestyles be made aspirational? How can we all change? Keith Irving has already answered that question.

Jess Pepper: I reiterate that it is about giving folk choices that make sense by ensuring that there are services that are accessible and reliable, that they have confidence in and that are a pleasure to use.

With Transport Scotland, I was involved in a project with children and young people that related to major infrastructure. It was absolutely clear that children wanted safe streets to walk, cycle and scoot in, and that active travel was their first preference. It was also clear that, as young people were growing up through their teens, they found that they had inadequate bus services, which shortened their opportunities and access to education, activities, jobs and social stuff. We hope that, if there are positive experiences early on, that will develop a shift to more active and sustainable transport and to people being happy to use buses, for example.

Keith Irving: Two years ago, we commissioned a report that looked at progress on cycling, which I will happily share with the committee. It answers a lot of members' questions.

Richard Lyle: I love teaching my grandson how to cycle. He is now absolutely loving that. Therefore, I am for cycling.

The Convener: The final question is from John Scott.

John Scott: To what extent can or should individual behaviour change be voluntary or driven by state intervention to ensure the protection of vulnerable urban and rural communities and climate systems?

Bruce Kiloh: That is a fantastic question. I go back to what Richard Lyle said—perhaps this will answer both of you. From our point of view, a lot of it is to do with affordability. If you want people to use a service—whether it be transport or anything else—you need to make it financially attractive. As you go about your business, you will see adverts all over the place that offer cars for £100 a month with £100 down. To a young person, that is a very attractive option. Until something happens to make sustainable transport—be it the active travel that the guys on the panel have been talking about or even public transport—as attractive to a family or whoever it might be, that change will not happen. It has to be made clear that the option is affordable to people.

As for your point about all of society being part of inclusive growth, that is a huge issue. For some deprived communities in Scotland, the world is a very different place; people there do not have the option to use the bus if an all-day ticket costs a significant amount of money. We as a society need to look at the affordability of transport to people in more deprived areas and at how they can participate fully in the inclusive growth opportunities that are available in many other areas of Scotland.

Is looking at the affordability of transport in poorer areas a strategic transport project? I would say so. Those are the kinds of things and changes that we need to consider if we are to make available to people sustainable transport options, from buying a new bike, getting a second-hand bike or renting a bike, through to buying a weekly or monthly train ticket.

Ian Findlay: At the heart of your question lies the balance between carrots and sticks or, in other words, between incentives and disincentives. I do not think that this is an either/or issue. If, as we have all been saying, choice is the key, we need to find a system that makes cycling, walking and public transport the first and natural choice for travel. That will mean a combination of carrots and sticks. Most behaviour change models suggest

that carrots get us further. I think that they are extremely appropriate when it comes to walking and cycling, but we should not ignore sticks, a very specific example of which is a workplace parking levy. That sort of stick can encourage people to choose to walk, cycle or use public transport, but it will work well only if a better or more sustainable choice is available. Any stick must be supported by the ability for people to choose a different option.

John Scott: Bruce Kiloh hinted that affordability, too, is important. At this point, I should declare an interest as a bus pass holder myself and a late convert to travelling by bus wherever I can. However—I realise that this would be a significant cost to the Government—should the concessionary bus travel scheme be extended, perhaps to the most vulnerable and those in rural areas, to encourage modal shift?

The Convener: Or to young people.

John Scott: Or to young people.

Mark Ruskell: Or to everyone.

John Scott: Indeed. I thank Mark Ruskell for that suggestion.

Bruce Kiloh: It is really about the choices that we as a society make. Once you give someone something, it is very difficult to take it away from them. The cost of the scheme has been huge, but so has the benefit that it has brought to you and others who have had the opportunity to use it, which is there for everyone to see. However, that has perhaps come at a cost to other parts of society, and the NTS and the STPR provide a good opportunity to look at how we spread the benefit.

I know that the Government has carried out a consultation on extending the concessionary travel scheme to, for example, modern apprentices. That would absolutely be a good first start, but should it then be extended to other groups? That is a question that we, other policy makers and analysts are trying to examine, and the results that we get will allow you to make an informed decision. However, it is most certainly the case that the travel scheme, which has been in place since 2006, has been a massive success in some ways but perhaps not in others, and it is time to review it to see how we in Scotland are benefiting those parts of society that need the benefit the most while keeping it in mind that we need to push people towards more sustainable behaviours.

Keith Irving: The programme for government talked about expanding access to the bike hire schemes that are growing around the country. That is a welcome initiative for jobseekers, apprentices and young people. We suggest that, for many people, access to bikes might work best.

The Convener: We have gone over time, but a couple of members want to come in. Finlay Carson has a question.

Finlay Carson: Given the painfully slow progress in producing a Scottish Oyster card, which would take the confusion out of transport and perhaps reduce the price of daily tickets, as the traveller would pay for what they got, is there enough incentive from the Government for various organisations to work together to look at the digital economy, big data and artificial intelligence in relation to rural bus services? BT now organises all its appointments using artificial intelligence, and that has taken a huge amount of cost and waiting time out of the system. Is there potential for big data to be used to deliver on-demand rural bus services? Is there enough incentive to do that?

Bruce Kiloh: Absolutely. We are fortunate to work in transport, which is one of the most innovative industries across the planet. There are huge changes in the way that it operates, which presents challenges but also massive opportunities.

Transport is all about the data. Who has the data, and how can people get access to it? If it is available, how much does it cost to get that data and information from another organisation? We need to look at that in Scotland. We are the regional transport partnership and public transport authority in the west of Scotland, but we cannot get detailed figures on bus patronage because they are commercially confidential. We are not here to promote one operator over another. However, if we could get access to the information, it would be incumbent on us as a public authority to be as transparent as we can be and to use the information for planning purposes and not for commercial gain. That would be a start.

We have done well with our smart card, which is operational in the subway and other modes. We have offered it to the Government as there to be used. It was developed using public money, in partnership with the private sector. There are huge opportunities for the future that we would do well to exploit.

Richard Lyle: I thank Mr Carson for bringing that in. Yesterday, the Government announced £1 million for ticketing. However, I do not want to ask about that.

Workplace parking levy? No. Is that not going backwards? We removed parking charges at hospitals and numerous other places where people were being charged exorbitant parking fees. A lot of firms offer employees free parking in their financial package. I can park in this building and save the Government £15 a day, because I do not park somewhere else. I park in this building for

free, and I do not intend to benefit from a parking charge when I can park here. I am not for your parking charge levy, and I speak on behalf of thousands of motorists who have been taxed enough.

The Convener: There was no question there. I bring this session to a close. I thank the panel for the advice and information. It has been an excellent session.

12:44

Meeting continued in private until 12:59.

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