



The Scottish Parliament
Pàrlamaid na h-Alba

Official Report

INFRASTRUCTURE AND CAPITAL INVESTMENT COMMITTEE

Wednesday 29 October 2014

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INFRASTRUCTURE AND CAPITAL INVESTMENT COMMITTEE
24th Meeting 2014, Session 4

CONVENER

*Maureen Watt (Aberdeen South and North Kincardine) (SNP)

DEPUTY CONVENER

*Adam Ingram (Carrick, Cumnock and Doon Valley) (SNP)

COMMITTEE MEMBERS

*Jim Eadie (Edinburgh Southern) (SNP)

Mary Fee (West Scotland) (Lab)

*Mark Griffin (Central Scotland) (Lab)

*Alex Johnstone (North East Scotland) (Con)

*Gordon MacDonald (Edinburgh Pentlands) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Professor Jillian Anable (University of Aberdeen)

Francisco Ascui (University of Edinburgh)

Professor Michael Fourman (Royal Society of Edinburgh)

James Kelly (Rutherglen) (Lab) (Committee Substitute)

Professor Susan Roaf (Heriot-Watt University)

CLERK TO THE COMMITTEE

Steve Farrell

LOCATION

The Mary Fairfax Somerville Room (CR2)

Scottish Parliament

Infrastructure and Capital Investment Committee

Wednesday 29 October 2014

[The Convener opened the meeting at 10:00]

Decision on Taking Business in Private

The Convener (Maureen Watt): Good morning, everyone, and welcome to the 24th meeting in 2014 of the Infrastructure and Capital Investment Committee. I remind everyone to switch off their mobile devices, as they affect the broadcasting system. That said, some members may consult their papers on tablets during the meeting.

Agenda item 1 is a decision on taking business in private. Does the committee agree to take in private item 3, under which we will consider the evidence that we hear today in the draft budget scrutiny?

Members *indicated agreement.*

The Convener: I am sorry: I should have said for the record that James Kelly is substituting for Mary Fee.

Draft Budget Scrutiny 2015-16

10:00

The Convener: Agenda item 2 is draft budget scrutiny. We will hear evidence on the Scottish Government's draft budget for 2015-16. This year, the committee is focusing its budget scrutiny on three of the Scottish Government's national performance indicators: reducing Scotland's carbon footprint; reducing traffic congestion; and increasing the proportion of journeys to work by public or active travel.

To assist us in our scrutiny, we have Professor Jillian Anable, who is chair of transport and energy demand at the University of Aberdeen; Francisco Ascui, who is director of the centre for business and climate change at the University of Edinburgh; Professor Susan Roaf of the school of the built environment at Heriot-Watt University—I hope that we have the names right; and Professor Michael Fourman, who is chair of the digital Scotland working group at the Royal Society of Edinburgh and is not unknown to the committee. I welcome you all.

We will move directly to questions. What is the likely impact of the draft budget on greenhouse gas emissions? Who would like to start on that? Is that your area, Professor Roaf?

Professor Susan Roaf (Heriot-Watt University): Yes. I think that the draft budget's impact on greenhouse gas emissions would, unfortunately, be less than I would like because of the way in which the division of the different accounts is organised. For instance, we have an idea of the exact amounts for the relative weightings for different areas that are being allocated to energy, water and waste. We know the percentages of their impacts, but it is very difficult to follow that through the budgeting process.

The draft budget might benefit from being more graphically clear so that it is easier to understand. There could be graphs of trends rather than pie charts so that people could see the relative development or the reduction of particular trends in the system. I do not know whether that has been brought up.

There is a slight lack of clarity on some of the impacts of the changes in the accounting methods. There has been a change in the accounting methodologies in appendix 1 and appendix 2, which resulted from a significant readjustment of the carbon budget figures from what was previously published and trended. We are given what percentage is responsible for those changes in the published figures, but not the exact

extent of how much impact as a whole the changes in the accounting method have had.

At this point, I would like to pass over to colleagues.

Francisco Ascui (University of Edinburgh): I agree that it is very difficult to say what the impact of the draft budget will be on Scotland's greenhouse gas emissions, because of the limitations of the method that is being used to assess the carbon impact. In essence, the greenhouse gas emissions estimated under the method are roughly proportional to spend and they are based on past average emissions for the goods and services that the sectors produce, so the only way to reduce the measure is to reduce Government spend overall or to wait for sectors to be decarbonised and for that to be reflected in the sector averages after a time lag of a few years.

If we want to have a better sense of the draft budget's impact, measurement should be split into capital expenditure and recurrent expenditure. With the recurrent expenditure on goods and services, what is relevant is not the sector averages of the sectors that produce them, but what we are doing in green procurement to procure goods and services that have a lower carbon intensity than the sector average.

The sector average would give you a useful benchmark or baseline, but the more important story is what the Government is doing with green procurement across the board. That would have to be measured using a different, bottom-up methodology, based on what different departments are doing in their green procurement strategies.

With capital expenditure, the important question is whether we are locking in higher emissions over the lifetime of the capital, or whether what the capital is spent on has lower emissions relative to what we otherwise might have spent the capital on. Again, that is not captured by the methodology, which only gives the sector average. What is really relevant is things such as how green the buildings that we are building are.

Another limitation of the current methodology is that it only captures some of the emissions associated with production—the direct emissions from the production of goods and services and the indirect emissions from the electricity consumed in that production. It misses a hugely important area—the emissions associated with the lifetime use of the equipment or the capital item that is being invested in.

The example that is cited in the carbon assessment of the draft budget—and has been in it for the past few years—is counting the emissions from the manufacture of insulation but not the resulting emission reductions in the

building in which the insulation is installed. Likewise, emissions from the construction of a road are counted but not the emissions from the vehicles that use the road. To get a better sense of the long-term impact of capital spending, we should be incorporating lifetime use emissions and emission reductions.

The Convener: We cannot look at the budget in isolation; we have to look at it in relation to documents such as the carbon emissions reduction documents, which are huge and which the Minister for Environment and Climate Change publishes every now and again. The Parliament has discussed them at length, as has this committee.

We cannot expect everything to be in the budget document. We have to look at the budget in relation to those other documents, to see the direction of travel.

Francisco Ascui: That is true. There are a lot of different carbon accounts being produced, but what is important is whether we can draw meaningful and useful linkages between them.

I struggle to see how the carbon account that is produced for the draft budget can be used. If it linked directly to the accounts that are done under the report on proposals and policies, we could produce more meaningful and useful information by showing the change in budget allocation to the different policies and measures for which estimates have been made elsewhere. If there was a change from one year to the next, it could be shown that spend was being reduced in an area that produces a lot of emission reductions while spend was being increased in another area that perhaps increases emissions. Having much more explicit links across would give a much better sense of that.

Those links do not exist at the moment because the two methodologies that are being used are completely different and incompatible, but it would be possible to do a different kind of estimate of the impact of the draft budget by looking across at other accounts that have been done in a more bottom-up way across Government.

The Convener: Yes, I think we have previously asked for that to be provided, but it has not happened yet.

Professor Roaf: This is the issue of the second-round emissions. The summary says that those impacts are not included, so the question is whether they should be in a parallel document.

Within the data that we are given, there are some clear connections between the actual spend in pounds and its carbon impacts. For instance, if you look at what I would call incomes to the budget, where the Scottish Government has

earned money, there are allocated carbon impacts of those moneys earned. It is very noticeable that the carbon impact of the European Union money that has come into Scotland under rural affairs, food and environment is typically about a quarter or a third—or maybe 2 per cent in terms of carbon—of the money invested, until we get to the EU support and related services where there is less EU income. Page 19 of the carbon assessment of the budget shows an income of £488 million to the Scottish Government that is a result of agricultural policies. That expenditure from the EU has resulted in a significant reduction in the amount of carbon emissions from Scotland, so we can see that that specific line of EU investment has been highly effective in reducing carbon emissions from Scotland but, technically, it is not included in the budget because it is income. For some reason, that particular investment was extremely effective in reducing emissions from Scotland.

I think across the board in the other figures—I do not know whether Professor Anable has found the same in transport or digital stuff—there is not such a hugely visible effect on carbon impacts as a result of Scottish Government expenditure.

10:15

Professor Jillian Anable (University of Aberdeen): My comments will be rather less about the detail of the budget lines and more about the balance of expenditure on various aspects within the transport sector and their impact on carbon.

In essence, there is heavy expenditure on roads such as motorways and other trunk roads and a very small proportion of the overall expenditure is on sustainable travel modes. Right there, we see very little overall expenditure on demand management attempts. The carbon reductions are largely concentrated on vehicle technology and expenditure to promote the uptake of electric vehicles. The carbon accounting that surrounds that policy and expenditure line is very much based on assumptions about uptake of such vehicles and the projections on car ownership and use in Scotland. Those projections can be questioned, in terms of what the potential rate of traffic growth is likely to be, or what it could be given other types of expenditure.

The type of scrutiny that I have done, which I think should be considered, relates much more to whether the transport sector is expected to pull more weight than it currently does in reducing carbon. That applies particularly to the road transport subsector, which is contributing an increasing proportion of emissions to Scotland's carbon budget.

The Convener: We will come on to transport specifically in a minute. Can you identify any examples of projects or programmes that will have a positive impact on reducing Scotland's greenhouse gas emissions or its carbon footprint?

Professor Roaf: It is clear that the built environment plays a huge role in the carbon emissions from Scotland yet, on page 16 of the carbon assessment, in the line on planning in the finance, employment and sustainable growth table, we find that a very small amount of money is allocated to building standards, and it has a very small carbon impact. If we were looking to Scotland to lead the world—I always look to Scotland to lead the world in this field—we could reasonably expect it to implement and develop a new tranche of forward-looking building regulations and approaches that would have huge carbon impacts. I know that work is being done on that already.

One particular example is that, under the European directive on the energy performance of buildings, we have a duty to report the carbon emissions that are predicted from buildings using standard assessment procedures. Over the past three or four years, it has become patently clear that the building models that are used do not in any sense reflect the actual performance of buildings in use. There is an enormous gap between how the modellers—the engineers and architects—say a building will perform, which is reflected in the certificate that is displayed in public buildings, and the amount of energy that those buildings use. We could have a system whereby the actual energy use every year is reported in a standard format. Rather than what is called the energy performance certificate, or EPC, which is required under the European buildings directive, we could have a declared energy certificate, or DEC, that involved reporting actual energy use or emissions. That information could then be fed back into a central database, as happens with the MOT system for cars. That would not be too difficult. If some investment was put into that, I believe that it would lead to a significant improvement in the actual performance of buildings, as declared.

The Convener: Do any countries do that at the moment?

Professor Roaf: Yes. England does it, as do a lot of European countries. In Australia, Sydney does it. Every big building in Sydney has to report its actual energy expenditure—it is published on a certificate on the wall whether it is an A, B, C or D building. For some reason, building standards in Scotland decided to use predicted energy expenditure. In the past couple of years, predictive models that use building modelling systems have been rather discredited. They give a good

indication, but it is often three, four or five times different from what buildings use in practice. It is a case of cranking that down and turning that screw. Estate agents and so on often put in pretty strong objections, because they do not want to be landed with a basket full of turkey buildings that they cannot move on. However, that is at the expense of buyers' understanding of how buildings perform.

The Convener: That is very helpful. We can certainly ask the Government about that when it gives us evidence on the budget.

Professor Roaf: On page 20 of the carbon assessment, there seems to be a fairly hefty budget line in housing and regeneration for supporting sustainability. That will have some impact. It is an example of a significant investment line that supports transitions and shows what is being invested.

Francisco Ascui: There are very many examples where the Scottish Government is doing fantastic things—and can do even more—to reduce emissions. The biggest sectors would be the built environment, probably transport after that, and then agriculture and forestry. Because energy policy is already fixed, I have not included that. However, we cannot infer any of that from the figures that are provided. It is simply not visible. The supporting sustainability line that Susan Roaf mentioned shows up as a positive contribution to emissions only because it measures the emissions associated with whatever it is that that figure is being spent on, but presumably all that stuff produces really good outcomes over the lifetime of the buildings that it is going into.

Likewise, on page 19 of the carbon assessment, 23,900 tonnes is allocated to woodland grants. I know from my involvement with the woodland carbon code, which was developed by the Forestry Commission here in Edinburgh, that that programme has incentivised more than 1 million tonnes of carbon sequestration. That does not show up in the account. All that we see are the emissions from spending the money, planting the trees and so forth. We know that there are good stories and we know that there are things that need to be looked into further, but that is simply not evident from this particular carbon account.

The Convener: Does anyone else have any further examples of projects that will help with reduction?

Professor Michael Fourman (Royal Society of Edinburgh): I presume that I am here because of the effect of digital, because I am not an expert on carbon. On the other hand, we see a lot of effects of digitisation that help to reduce energy use and carbon emissions. For example, there are changes in transport patterns, with people working from home. There is the consolidation of orders so

that, instead of everyone driving 20 miles to the shop, one van does a round and delivers everything. According to recent studies, smart energy, and improving the efficiency of energy usage in the home, has huge potential.

There is also the fact that the communications and computation technologies that we use are themselves significant users of energy. Things such as cloud computing can make that use of energy far more efficient. I do not see anything trying to draw those lines out in the accounting that has been done in the carbon assessment of the draft budget. If we were really to understand what the impact of digital could be, more work ought to be done to make that linkage.

Francisco Ascui: It would be another example of the induced effects that are currently excluded.

I add that roughly half of the United Kingdom's emissions are from sectors that are controlled under the EU emissions trading scheme, and we cannot do anything to further reduce emissions from those sectors because any reduction that we produced in Scotland or the UK would simply allow emissions to be increased somewhere else in Europe, as they are subject to a Europe-wide cap.

An incremental improvement that might be feasible with the existing methodology would be to exclude EU emissions trading scheme sectors from the account so that we could get a picture of the emissions that the Scottish Government can do something about. The obvious sectors would be agriculture and forestry—all the rural things—and the built environment and transport.

Professor Roaf: May I query something else? The sustainable action fund, which is under the "Climate Change" heading at the top of page 19 of the carbon assessment of the draft budget appears to have fairly low carbon impacts. You might want to drill down into that.

Building on something that Professor Fourman said, I bring two recent developments to your attention. First, in September, we hosted here in Edinburgh a carbon accounting conference for cities and communities, which was terrific. It was clear that cities and communities in Scotland were not getting sufficient assistance in providing credible, transparent accounting methods. That is now being looked into, but they seemed to be rather at a loss as to how to more accurately develop their own accounts at a community level, or at a campus level in the case of universities.

I do not see anywhere in the investment streams where we are supporting communities, individuals, building owners and so on to do proper accounting or develop the methodologies. It is being left to cities such as Aberdeen, which has just put out a tender for a carbon account for the whole city. I presume that that appears in the

budget lines for expenditure on local government. Rather than every city having to relearn the tricks of how to accurately account, we should surely have some central organisation or management programme in the Government, but where would that sit? Would it sit within building regulations?

I flag up that communities and organisations need more central support to ensure that they are accounting on comparable lines and their outputs can be compared, and so that they can continue to develop. That is one funding stream that is not in the budget.

Secondly, I do not know whether you listened to “Question Time” from Wales the other night, but the participants talked about energy, which is one of the biggest drivers. The way to decarbonise Scotland is to decarbonise its energy supply, primarily. Scotland is now leading on community energy systems whereby decentralised community energy organisations can use new technologies and smart control systems to balance supply—local stochastic renewable supply—and demand, and it looks as if that is going to be really effective.

I do not know whether that would come out of the climate change policy fund or the supporting sustainability fund—that is not clear—but it is a way in which we in Scotland can help to keep the lights on. You will remember that last year the whole of the north of Scotland was blacked out for some hours. We can help by providing more robust and resilient energy units.

I flag up the fact that considerable investment from the energy team is going into developing Community Energy Scotland. We have proved, through research in the north of Scotland, where we are using European grants, that we can have a step change in emissions reduction by managing energy systems locally with smart systems. That programme should be integrated with others.

10:30

The Convener: We will maybe let the Economy, Energy and Tourism Committee know that for its deliberations. Are there any examples of projects or programmes that have a negative impact on reducing our greenhouse gas emissions?

Professor Anable: As I said, the additional expenditure in this budget compared with last year's on roads and motorways does not appear to be particularly well justified in terms of its potential carbon benefits and therefore its potential knock-on carbon reduction benefits. The overall transport budget has increased, which is largely due to the increase in the road network budget. As I said, there does not appear to me to be any discussion or inclusion of any policies to lock in the potential increase in traffic that might result from the road building. What you essentially have

with that kind of policy is a slowdown in the rate at which congestion—I know that we are not talking about congestion at the moment—will happen, but without that lock-in, congestion will still result; it will just be further down the accounting line, if you like.

The fact that the road building expenditure is not balanced by attempts to mitigate the impact of traffic growth in urban areas means that little is being done to reduce carbon from roads other than by reducing carbon from the fuels and the vehicles themselves. My recommendation would be to think again about what could be included in terms of traffic management and demand management.

Professor Roaf: Following on from that, I point out that the people doing the standard energy analyses for Scotland at a country level systematically ignore the potential for using solar energy to decrease the level of carbon emissions from the built environment. A second consideration is that we are not looking at social impacts, on which we did a big study in Dundee. For every solar home produced for those in fuel poverty—putting in photovoltaics for solar hot water—we take a household out of fuel poverty for ever. We did a very good study that showed that if we put photovoltaics and solar hot water in all the council houses in the deprived areas of central Dundee, we could take the majority of the population of poorer and socially deprived people in Dundee—over 2,000 families—out of fuel poverty for a total cost of about £67 million, which I think is a quarter of the cost of the proposed Aberdeen ring road.

When you are deciding whether to develop new roads or to do something that would take entire cities out of fuel poverty and reduce carbon emissions significantly at the same time, there is no context for the trade-off in terms of looking at the bangs for bucks project by project. That might be a good way of showing MSPs how their bucks are being spent and how many carbon bangs they are getting for them.

The Convener: We will move on. I do not think that the comparison with the cost of the Aberdeen western peripheral route will go down well with some members of the committee.

Adam Ingram (Carrick, Cumnock and Doon Valley) (SNP): I think that we all agree that it is rather difficult to evaluate the impact of the budget on greenhouse gas emissions. Could something relatively straightforward be introduced in the budget to provide a bit more information that would help us with such evaluations in the future? What might that be?

Francisco Ascuí: I fear that I might have been a bit negative about the carbon assessment of the

budget. It is worth acknowledging that the first time it was produced, which I think was four years ago, it was really groundbreaking. The Scottish Government was probably the first Government in the world to produce such a document. That is great—I am all in favour of accountability for greenhouse gas emissions and we have to start somewhere—but I think that it is now time to keep Scotland at the forefront of this area by developing what we are doing so that it continues to serve as a leading example for other countries to look at.

The big question is whether to move away from the economic input/output analysis methodology to something that is more bottom up, but if we stand back from that big step, there are some incremental improvements that can be made. For example, it might well be possible within the existing model to separate sectors that are covered under the EU emissions trading scheme from the other sectors and to differentiate between those groups of sectors in the accounts. The overall figure could still be produced, but it could be split into the emissions from the EU ETS sectors, which we cannot do very much about, and those from sectors that are not covered by the EU ETS, in which we could take further actions that would result in a real difference in emissions.

Another incremental change that could be made would be to focus more on the changes in the budget allocation from year to year. That would involve saying that, within a certain portfolio, the change was in such-and-such an area and identifying whether it was a high-carbon or a low-carbon part of the budget. That would give a sense of when changes in the allocation of money resulted in some sort of future impact.

Beyond that is the issue of whether we should start to pull into the carbon assessment of the budget some of the bottom-up analysis that is being done elsewhere and to establish much more effective links across the different carbon accounts that are being produced. I think that that could be done in a step-by-step way. Because all the analysis has been done for RPP2, it should be possible to say that the changes in budget allocation from year to year can be linked to changes in those proposals and policies for which estimates have already been made in a bottom-up way. That way, some rough estimates could be made of what the budget changes are likely to result in.

Professor Roaf: As I said at the beginning, we have done some studies of carbon emissions in relation to gross domestic product at city level. Showing in a graph the trends in expenditure per capita over time and putting alongside that money line the carbon emissions for each sector gives you a very clear idea of the trends in expenditure and the respective trends in carbon emissions.

You can see where the carbon impacts as a result of increased or decreased expenditure are happening, and where there are step changes. That makes it very visual. You could quite easily do that for each year since 2006 with just the carbon emissions, which would make the information much easier to comprehend.

Adam Ingram: Good. You mentioned carbon accounting methodologies. Is there such a thing as best practice in that area? You mentioned that we ought to be assisting our cities and communities in doing that type of thing.

Professor Roaf: In Scotland, and in the UK, we are very lucky to have some really good carbon accounting organisations and companies. There are different methods, and people make money from carbon accounting. If you go to a particular company, it will have a black box. You will feed in your data, and the people there will come up with an answer that is not transparent or comprehensible because they have put their own assumptions into the box. That is because they are selling a product for carbon accounting, whether at a city or community level, or for buildings or companies.

It is quite easy to develop transparent accounting systems—we have the carbon accountants who can do it. They could develop a Scottish methodology for carbon accounting in communities or cities that would use Scottish rules and Scottish assumptions. The trouble with the larger Department of Energy and Climate Change accounting systems is that they use Westminster-facing assumptions. There may be 20 different values for a certain factor that is put in for England, whereas for Scotland there is just one value, and we all know that Edinburgh is very different from Thurso.

I do not know what the other witnesses think about that, but it would seem to be a very simple step forward to have first-class, transparent rules that communities, cities and business owners can apply for accurate Scottish accounting.

Adam Ingram: Who would be responsible for drawing those up?

Professor Roaf: Aberdeen City Council, for instance, has just gone out to tender and has got some brilliant people tendering for the work. The Scottish Government has gone out to tender—for instance, when it first developed the methodology in 2010—but it would now be a matter of putting together a proposal and getting very good people from Manchester, Oxford and Edinburgh to apply. You could then choose the best team to produce a particular set of assumptions and rules. Those would have to be ground truthed, or tested, with the whole carbon accounting community in

Scotland so that we all agree, but that is a fairly simple process.

Francisco Ascui: Such systems are being developed rapidly in all sorts of venues all over the world. One of the peak bodies is the greenhouse gas protocol initiative, which is a joint venture of the World Resources Institute and the World Business Council for Sustainable Development. The initiative first came up with the corporate carbon accounting standard that is now the de facto reporting standard for corporations. Since then, it has produced—and is still producing—a lot of new standards. One is in the area of community greenhouse gas accounting, and another is in policy and action accounting. We should certainly keep an eye on those sorts of developments.

Professor Roaf: The initiative is developing credible and creditable accounting methods, but a local community that looks at the documents, which are very big and contain dense technical material, would flounder. Therefore, some way of getting international GHG protocol-facing but easily useable and Scotland-centric accounting methods for communities would be very welcome.

10:45

Before, it was thought that that would be too hard to do and a lot of fudges and what-ifs were used, but it is perfectly possible, now that the GHG community protocol has been produced, to reinterpret that. That would mean that people who are involved in bottom-up action planning for carbon reductions could feel confident that they knew where they fitted in the larger, different scopes of the accounting process.

Adam Ingram: What about the Scotland-wide approach? Would that, too, be adaptable to a more strategic approach? Is it possible to create a methodology for Scotland that could be trickled down to communities?

Professor Roaf: It is a matter of compatibility because the Scottish Government's methodology is already very good and continually improving. You will notice that in annex A and annex B of the carbon assessment, the Government has detailed some developments and, as you will see, it has significantly changed and improved certain sections of its methodology. However, in any bottom-up methodology, it is important to ensure compatibility between the top-down and the bottom-up approach and compatibility between sectors.

As far as, say, forestry in Scotland is concerned, community groups that account for peat, forests or agriculture are sitting around the table, saying, "What do we need to do? We need a large estate owner to say, 'I will get better carbon results if I reinstate the peat or put in forestry or turn the land

to agriculture.'" You then have to integrate the methodology to get a compatible reply, which is what is happening. We need compatibility between sectors as well as vertical compatibility between the top-down and bottom-up approaches.

Francisco Ascui: I agree with most of that but it is important to recognise that this is a matter of horses for courses and that no one methodology will work for all the different needs. We have to think about the types of decisions that we are trying to support with the accounts and then choose an accounting methodology that is appropriate to support that decision.

We will have accounts that are incompatible with each other because they are being generated to support different types of decisions. It is important to recognise and foreground that so that people do not expect the accounts to be compatible or to add up all the time, unless they have been created for that purpose.

Professor Roaf: That is why transparency is really important. Although accounts might not be compatible, we have to know what assumptions have been made and whether they are compatible. For instance, are they using the same carbon factors? The move towards more and more black-box systems is not going to enable people to make the best decisions.

Professor Fourman: To come back to the strategic point, I am slightly bemused by the fact that neither the word "digital" nor the word "broadband" occurs once in the carbon assessment of the budget, whereas earlier policy documents contained statements such as:

"Our 'Low Carbon Economic Strategy' sets out how Scotland can secure the transition to a low carbon economy. Digital technologies will be an integral part of that transition by, for example:

- replacing goods and services with virtual equivalents
- allowing more efficient use of energy
- offering virtual technologies that allow online shopping, teleworking and access to online public services".

Although that statement was in the strategic documents—it was published three years ago—we are still talking about this as though digital has nothing to do with carbon. Unless we make those kinds of linkages, we will just be watching what is happening and, in the end, will make no change. It will be a case of saying that although houses and cars might be slightly more efficient than they used to be, people are basically doing the same things, making the same journeys and leaving their lights on. Unless we include such aspects in the assessment, all of that will be lost.

The same goes for other issues that have been raised. For example, building roads means more people using their cars, so reducing congestion

puts the carbon level up in the long term because the reduction is only temporary.

Professor Anable: Again, this comes down to a need for transparency in the assumptions. It is not that some of the predicted traffic growth will not include assumptions about induced demand on roads, but those assumptions are not always transparent with regard to what has been included.

Another point is that some of the digital interventions that were mentioned earlier, such as homeworking, teleworking, videoconferencing and home shopping, are precisely the sort of interventions that are very difficult to evaluate and make predictions about. For one thing, the behavioural changes that are embedded in those interventions will potentially take a very long time to materialise. In the early stages of some of the interventions, the carbon reductions will be very small, but the potential for longer-term impacts and particularly the cumulative impact across interventions can be very large and might lead to step changes down the line.

The combination of the short-term scrutiny of individual interventions and the need for a longer-term look at cumulative impacts can be a big problem in accounting, and that problem has not been particularly well addressed in any of the accounts that I have looked at. We need to consider many types of small-scale interventions in the transport sector and very much so in the digital economy.

Although the evidence might suggest that the benefit cost ratios included in the accounting represent good value for money, that might not be the case when aspects other than carbon, such as the health or economic impacts, are included. If we are scrutinising individual measures for the carbon impact, we might not be looking at the cumulative longer-term impact.

Francisco Ascuí: Going back to the first question, which was about the further changes that could be made to the current carbon assessment of the budget, I want to add something else. One change that I think would be possible using the existing economic modelling relates to the fact that Government is representing only half the equation at the moment and that it has an impact in how it raises money as well as in how it spends money. With the transfer of more taxation powers to Edinburgh, that aspect might well be more relevant in future.

It would be a world first for us if we started to look at the impact of Government taxation on greenhouse gas emissions as well as the impact of its spending. The model will suffer from all the same problems, and the same comments apply in the sense that it will look only at sector averages and should perhaps be supported by narrative

about what is being done to ensure that those taxes are greener than might be represented by sector averages, but I think that that would be an interesting—and feasible—further development.

The Convener: We must move on now.

Professor Roaf: I have just a quick point. For some reason, figure 3 on page 11 of the carbon budget lumps energy, water and waste together at 40 per cent, while emissions from mining and quarrying are at 1.3 per cent and emissions from finance and business are at 1.2 per cent. Did you know that the largest single user of electricity in Scotland is the water industry? We need to get some definition here. How much of that figure is water, how much energy and how much waste? Are we hiding something? Is there an underlying problem that is being masked by those things being lumped together?

Mark Griffin (Central Scotland) (Lab): As well as greenhouse gas emissions, we are focusing on the sustainable and active travel budget and the elements of the budget associated with reducing traffic congestion. Do you feel that the current level of funding for sustainable and active travel projects is adequate and is being delivered to best effect?

Professor Anable: My understanding of the budget is that the real-terms expenditure on active travel and public transport has reduced overall. I note, for example, that expenditure for sustainable and active travel over the coming budgetary period is £25 million. I have looked at that in the light of work in which I have been involved on smarter choices-type interventions. Some of my work in Scotland and England has been about evaluating demonstration programmes such as the smarter choices, smarter places programme, and I have done quite detailed analysis of areas in which individual expenditures are incurred in providing alternative transport measures versus promoting them, looking at the expenditure per capita and the optimal balances of expenditure.

There has rarely been a study that I have been involved with or which I have looked at that has suggested that the expenditure per capita—if you can look at that £25 million on a per capita basis—should be so low. Essentially, the expenditure is just over 1 per cent of the total transport budget. If you were to follow the analysis of the sorts of evaluations that we have looked at, you would see that the figure should be more like 3 per cent for local, sustainable transport interventions. So, in direct answer to your question, I am afraid to say that it is a disappointing level of expenditure, and it is particularly disappointing that it appears to have reduced.

Mark Griffin: Would the 3 per cent figure that you mentioned be more appropriate, if we consider international comparisons?

Professor Anable: Yes. With regard to international comparisons, that is what we have understood from our evaluation of what works, which is the most important thing. There are all kinds of complications in the sense that different levels of expenditure are required depending on the geographical area and, indeed, the baseline. In areas where social norms and levels of provision are already well established, the expenditure could be less, but in hard-to-reach areas such as suburban areas, rather than town and city centres, a slightly higher level of expenditure is required on a per capita average basis. The figure that I mentioned is just an average from studies that have tried to scrutinise that type of expenditure.

Mark Griffin: Do you think that the money is being spent in the right areas? Is the Government's focus on the right areas, or should that expenditure be transferred to other areas?

Professor Anable: There has been a fairly scattergun approach with what has in recent years been a fairly limited budget. The smarter choices, smarter places type of expenditure is a different model of spending such funding, because it looks at exemplary projects that do a particular job. We have learned from that, but I think that the funding is now spread far too thinly and not very strategically.

I find it difficult to answer your question, because as far as I understand what is involved it is not very clear what the expenditure on active travel is going to be. One route would be to focus on exemplary and strategic-type projects, but I neither see that in the budget nor understand the delivery model for spending the money that filters down to the local level.

11:00

Although it is best for expenditure on active travel and local sustainable travel interventions to take place at the local level, central national funding also needs to exist because in many instances local authorities do not have the skills or the people to be able to deliver such projects. Until that is the case, the central budget line will be necessary. Nevertheless, at the moment, I find it difficult to understand the delivery strategy for that line of funding.

Jim Eadie (Edinburgh Southern) (SNP): I have a supplementary question about active and sustainable travel. I take your point about the need to increase investment; indeed, those of us who are involved in the cross-party group on cycling have been actively pursuing and promoting that

message. The figure that you are quoting from the budget is the 1 to 2 per cent of the overall transport budget that is being spent on active and sustainable travel, but does that figure include the match funding from local authorities? For example, the City of Edinburgh Council, which is led by a coalition of two parties, is now committed to spending 8 per cent of its transport budget on sustainable and active travel. Have you factored that into your calculations?

Professor Anable: No. You are absolutely right—I did not include that when I mentioned the 1 to 2 per cent figure. There have been good improvements in walking and cycling rates in Edinburgh, but in the areas surrounding Edinburgh and other areas of the country the picture is unfortunately not quite as clear. You could take that as testament to the effect of the increased expenditure in Edinburgh and proof that such investment is needed to make active and sustainable travel work, but the fact that walking and cycling outwith Edinburgh are reducing is very disappointing.

Jim Eadie: Thank you. I will pursue the issue of demonstration projects later.

Mark Griffin: My other question is about the funding that is available for reducing traffic congestion. Are you confident that the budget lines will contribute to such a reduction, and is the money being spent in the best areas to ensure that that reduction happens on a long-term basis?

Professor Anable: I am afraid to say that, again, I am not very positive about that. I do not feel able to be positive because I see no clear targeting of expenditure at traffic and demand management measures for the real congestion hotspots. What I see is the alleviation of congestion largely through road expansion rather than through demand management. As I have said, that might improve the national performance indicator for congestion but it will only push the problem further into the future. In that sense, it depends on what you want to read into the indicator.

Mark Griffin: Do you see any conflict between the budget line that supports reducing traffic congestion or supports sustainable active travel and a commitment to reducing greenhouse gas emissions? You have already touched on the impact of increased road building in future, but are there any other areas in which you see such a conflict and where those budget lines will result in a long-term increase in greenhouse gas emissions?

Professor Anable: The encouragement of alternative fuel vehicles is a difficult matter in this policy area. It is difficult to argue against the need for more efficient vehicles and cleaner fuels, but

they do not address congestion and do not help active travel.

Given how little there is for us to go on at the moment to allow us to understand how new vehicles will be used in the future, our modelling and assessments are undertaken on the understanding that they will be used in the same way that vehicles are used now. They involve a retrospective fitting of cleaner vehicles to current travel patterns, but that is not necessarily what some of the more behavioural intelligence suggests might happen. Because people will have to sink more money into what will be more expensive vehicles, they might well be used more. That means that there is a direct conflict between encouraging the uptake of vehicles that might end up being used more and attempts to alleviate traffic pressure.

Gordon MacDonald (Edinburgh Pentlands) (SNP): Before I move on to my own questions, I will ask about traffic congestion, following on from the point that Mark Griffin raised. How do you measure the impact of cycling on greenhouse gas emissions and carbon reduction?

Professor Anable: That is another example of what I alluded to earlier. It is incredibly difficult to do that because of the incremental nature of what we are measuring.

Increasing the uptake of cycling can be slow, and it is often difficult to evaluate it to understand whether the cycling is additional or has supplemented car-based travel. It may also take away from bus travel. If there is bus congestion, it may be a good thing for people to cycle instead but, overall, for bus revenue and therefore the sustainability of the bus system it might not be a good thing. Cycling can also interfere with buses. It can reduce running times if cycles are used in bus lanes, so conflicts can happen.

It can be incredibly difficult to measure the impact of cycling, which is why we have to think more about the longer-term picture—what we want our towns and cities to look like and the degree of road space that we could give over to alternative modes—and the impact from the integrated transport system rather than any individual mode. We have to plan and evaluate it in an integrated way because there are many dangers in trying to evaluate individual interventions in a transport system.

Gordon MacDonald: It is very difficult to retrofit a road in a city when we are talking about additional space. We could be in a situation in which cycling increases the greenhouse gas emissions because there are 20 vehicles travelling at 10mph behind a cyclist and they cannot overtake because the road is one lane either way.

Professor Anable: That is why we have to think about the longer-term impacts. The idea is that, as we increase cycling, it will become more of a norm: more people will cycle and, eventually, they may start to reduce the number of cars in their households. However, that reduction is likely to happen over a very long period.

Because of the way that we account for carbon reduction, we do not think about the potential big shifts in household car ownership that could take place as a result of increasing the other modes.

Gordon MacDonald: My next question relates to the Scottish Government's comments on its infrastructure budget. The draft budget states:

"An efficient transport system ... is essential for enhancing productivity and delivering faster, more sustainable growth".

It goes on to say:

"Ongoing investment in transport also connects regions and people to economic opportunity".

Given the link between housing and transport, along with the need to reduce greenhouse gas emissions, are there any missed opportunities in the budget to develop a more sustainable transport infrastructure?

Professor Anable: As you allude to in your question, the missed opportunities can be in not looking at land-use planning policies and transport policies together. There is a lack of joined-up thinking about where we are developing versus our transport infrastructure.

A more specific point in relation to transport expenditure is that it is again a bit disappointing to see a reduction in expenditure on rail. Well, it is not a reduction in expenditure—sorry, I do not have the figures right in front of me—but there is a missed opportunity in not using some of the savings that are being generated by the lower expenditure on rail franchising to accelerate the capital expenditure programme on rail. Although that capital expenditure programme is still healthy, it could have been accelerated.

In the context of thinking about the relationship between transport and the economy, some interesting structural changes are taking place in the transport system, particularly in relation to car traffic. Since pre-recessionary times, we have seen evidence that the increase in car traffic is slowing down. During the recession, as we would expect, we saw absolute reductions, but we are starting to see an increase in car traffic.

The missed opportunity is in not looking at the trajectory and considering whether we can lock it in and tap into some of the changes that have been taking place. Underneath those aggregate figures of a slowing down in the growth of traffic is a real increase in rail use—hence my suggestion

that that is a real missed opportunity, particularly right now. We could be looking at those structural changes and trying to push them in positive directions.

Gordon MacDonald: Do the other witnesses want to comment?

Francisco Ascui: I am possibly going to pre-empt something that Professor Fourman will say. I am not a transport expert, but I would really love to see more evidence of investment in digital smart thinking in the transport sector.

Professor Fourman: I will say something similar.

A few years ago, I would not have dared to suggest this in such a place because it would have seemed a bit wacky, but driverless cars are now a reality, and we have to start thinking about how we will use them. We need to consider how we will use shared cars and how we can make it more efficient to go round our cities or along our motorways. That will happen in many places in the world, and if we want to be a leading nation we have to think about it. I defer to the transport experts on how that will happen, how it will integrate with the things that we are already doing and how road use will change, but it should be on our agenda right now.

While I have the committee's attention, I will say something about missed opportunities. We see lots of opportunities for reducing transport use through people having digital connectivity, particularly in remote communities. However, the current investment in digital in Scotland will not bring superfast speeds to a large proportion of the people in the Highlands and Islands. In Scotland as a whole, at least 44 per cent of those who are not currently served will not get superfast speeds according to the current EU definition. The idea is that everyone should have those speeds by 2020.

I think that we have invested almost £300 million in broadband over five years, and we are investing £800 million in rail and £400 million in buses and ferries over one year. Therefore, there is a missed opportunity in not saying, "This can really change the way that things happen if we take it seriously." I do not believe that digital connectivity is yet being taken seriously in the UK or in Scotland.

11:15

Gordon MacDonald: A section of questioning on digital infrastructure is coming up shortly.

Professor Fourman mentioned driverless cars. Are there any other examples of international best practice in relation to low-carbon transport that are suitable for implementation in Scotland?

Professor Fourman: I think that digital has already done quite a lot. I believe that the increase in passenger numbers on Lothian transport owes a lot to the buses app. I would be interested in comments on that. People can tell when a bus is coming, and they will wait for it. That makes a huge difference.

We do not yet integrate different transport providers very well. Glasgow does not have an integrated transport app in the way that Edinburgh does; it has individual ones for different companies, which is missing a trick. The user simply wants a bus and they do not care who turns up with it; they simply want to know when it will turn up.

There is a lot to be done in making information available to people to make the public transport option more attractive. Digital can help a lot with that.

Francisco Ascui: We led the way to a certain extent with the Edinburgh city car club, which is now City Car Club and is all over the UK. There are many other similar car-sharing schemes around the world. That was a fantastic initiative, which I was a founding member of.

Cars are incredibly inefficiently used assets. We have millions of them just sitting around doing nothing for most of the time. There must be huge potential to expand such schemes, perhaps by using smart technology to enable people to donate their cars. People could simply put a little box into their car. When it is sitting there and they do not need it, other people could use it.

Professor Anable: I want to comment on both issues.

First, I congratulate the Scottish Government on its support for car clubs in Scotland. I am afraid that I got a little confused about where that sat in the budget lines. I think that it is in the future transport fund and that extra money has been given to car clubs to roll them out.

There has been very innovative thinking about the size of settlements for which car clubs could be appropriate with initial support, and there has been longer-term thinking about how they can help to promote alternatively fuelled vehicles, particularly electric vehicles, how they can be connected into the grid in island communities and so on. That is very progressive and it ticks many of the boxes that relate to integration across digital, transport and energy. There is thinking about social exclusion issues, as well. Therefore, that thinking is important.

On the comments about real-time information in transport, it is not an overstatement to say that the biggest revolutions in transport in recent decades, such as there have been, have been digital. The

ideas of information and that people are now looking much more to use their travel time productively are among the reasons behind the resurgence of train travel. They are not necessarily the main reason for but are a significant contribution to younger people delaying car use.

We are also seeing more walking because people can listen to music while they walk. That is the evidence coming out of recent studies that are trying to understand why young people are delaying their uptake of car licences and car ownership. A lot of the reason is that they want to stay connected on the move. That underlines the importance of joining up the agendas.

Professor Roaf: You may not be aware of this, but under the Scottish building regulations a modern office block will fail if it is naturally ventilated and pass if it is air conditioned. When we talk about transport, we are talking about the quality of air and pollution levels in city centres. When you create visions of a future Scotland, you have to look at the links between air quality, noise, transport approaches for city centres and the nature of the buildings in cities, because by removing anything but more public transport approaches from the city centres you will enable designers to open the windows. There are huge knock-on effects from our vision of what our transport futures should be.

Another consideration is the climate resilience of transport systems and commuting patterns. We are told that the middle classes are evaporating because wages are not going up but the cost of living is. The cost of petrol at the pumps has a huge impact, and, during the recession, commuters who travel into Edinburgh from Fife in their SUVs and so on were beginning to find their monthly expenditures extremely squeezed as the price went up from £120 a tank to £130 or £140 a tank.

Where would such issues be covered—in the future transport fund? The importance of creating a vision of a low-carbon, climate-resilient and cost-of-energy society must be integrated into the thinking.

The Convener: Before we move on to emissions and housing, we should have a short comfort break.

11:22

Meeting suspended.

11:28

On resuming—

The Convener: We move on to emissions and sustainable housing, on which James Kelly has some questions.

James Kelly (Rutherglen) (Lab): Before I ask about emissions and sustainable housing, I would like to return to Professor Roaf's initial comments on the change in accounting methodology. Can you expand a bit on that and provide some clarification?

11:30

Professor Roaf: I am looking at page 4 of the carbon assessment of the 2015-16 draft budget. The Scottish Government made a number of changes to the method that it used to calculate the input-output figures and it says that it used an "improved methodology". Annex A gives details of the methodology and a number of ways in which it changed, and it sets out the relative impacts of the changes. For instance, the change to the new UK SIC07 analytical tables accounted for 16 per cent of the rise in the Scottish Government's carbon figures, and the revisions to the greenhouse gas emissions ratios in the method accounted for 25 per cent of the rise. An industry fixed product sales methodology accounted for 2 per cent, and the production of the closed-economy UK tables accounted for 67 per cent.

The Government changed the tables that it used for the method and it included a couple of additions or developments. It says how much those things changed the overall step increase in our carbon emissions, but it does not tell us what percentage the step increase was. We know what it is composed of, but how big is it? Has there been an impact of 1 million tonnes or 5 million tonnes? We need clarification on that.

James Kelly: Yes. The methodology has been changed and we have figures on that, but we need more detail to properly understand the impact.

Professor Roaf: We need to know how much of a shift change has resulted. If the Government used the old methodology, would the emissions be 8.8 million tonnes or 6.5 million tonnes? What is the scale of the change?

I ask the other witnesses whether they noticed that information.

Professor Anable: No.

Francisco Ascuí: No.

Professor Fourman: No.

James Kelly: Thanks for that explanation.

On housing and regeneration, what is your general overview of the impact of the draft budget on the objective of reducing greenhouse gas emissions? I know that we have covered some of that.

Professor Roaf: The bulk of the money—£628 million—will go on growing the housing supply. The Scottish Government's figure for the impact of that increased spend is 187,000 tonnes of CO₂ equivalent.

The Government is going to spend £90 million on supporting sustainability in the housing sector, but that will result in an increase of 27,000 tonnes of CO₂. Surely if the Government is making a huge investment in supporting sustainability in the housing sector, it would expect that to result in a decrease in emissions, not an increase.

James Kelly: I take your point.

Witnesses gave some good examples of good practice, such as building standards and solar panels in Dundee. Just before the break, Professor Roaf gave the example of air conditioning. Can you give any examples of good practice in relation to housing associations, either in Scotland or throughout the international community?

Professor Roaf: Over the past 10 years, we have been pushed from Brussels to introduce something called passive housing standards, which are very much 1990s thinking. They involve increasing insulation, getting rid of draughts, installing better windows and getting rid of cold bridging so that heat is not leaked out of buildings. The passive house movement puts in heat recovery and recirculation systems. It starts by fixing windows in housing so that they cannot be opened, then it takes heat that is lost from buildings through ducts above the ceiling, puts it through a heat exchanger, which is supposed to grab the heat back from the air that is being exhausted, and mixes it with incoming air with a fan.

Those systems, which cost £5,000 to £7,000 each, and probably about £7,000 to install in housing, usually duct air above the plaster of the ceiling, so the heat is lost anyway to the roof space. They do not actually regain much heat at all, and the move to have fixed windows in housing is not really suited to Britain, which has quite a damp, temperate climate.

Housing associations have moved into putting heat exchange systems in housing and, in places, fixing windows so that they cannot even be opened for natural ventilation or to get fresh air in. They have put in huge windows that would be very

difficult to open anyway. There are a lot of modern flats here in Edinburgh with lightweight timber structures and large west-facing glazed areas, which are suffering from significant overheating. Nowadays, for £7,000, we can put into a house 4KW of photovoltaics—solar electric—plus a solar hot water system of 3KW, so for the same price we can have a house that pays for only 20 to 30 per cent of its hot water each year and can generate most of its electricity free. The Joseph Rowntree Housing Trust has just taken 425 heat recovery systems out of its houses because they were creating such poor air quality. My hope is that the £90 million for sustainable investment will go into putting renewable energy systems into buildings, rather than the heat exchange systems that are failing in large numbers in Britain.

Page 19 of the carbon assessment of the draft budget gives figures for the rural affairs portfolio, and under the "Climate Change" heading is the land managers renewables fund. That fund has resulted in significant investment in renewables on agricultural and forest estates. We need to think about making such investment in housing, because the only way we are going to take people out of fuel poverty is by giving them the means of generating the energy that they need on their own roofs.

I also hope that we will put in some water storage tanks. We have 25 million homes in Britain. Previously, the hot water tank stored heat, and if the lights went out or people could not afford to pay for the heat to be on all day, it would store the heat for them. In 10 million homes in Britain, the water storage tank has been taken out and a combi boiler has been put in, so there is no heat storage at all.

We have a fair chunk of money here. Let us put it into ensuring that people have heat storage in their homes and the opportunity to generate their own energy from their roofs, instead of using the rather flawed mechanical systems that are being pushed by industry.

James Kelly: Those points are well made and you gave good practical examples. I am sure that the committee will take your points on board.

I have a final question for Professor Fourman, who spoke about the importance of digital infrastructure investment and the potential opportunities that that provides. In areas of social deprivation, where there is not a big digital uptake, there is a great opportunity for us to give people information on the tremendous opportunities that exist for them in taking up digital. What could be done to encourage digital uptake in areas of social deprivation where there is not a big uptake already?

Professor Fourman: The Glasgow Housing Association is undertaking some good work. It is piloting—in partnership with BT, in this instance—bringing one supply into a multi-occupancy building and sharing it between all the occupants in a way that gives each of them individual access. That is quite different from the standard way of providing supply in the UK whereby everybody has their own line back to the cabinet. One line goes to the building and the supply is then shared within the building, which reduces the cost substantially. The results have been very good, and Glasgow Housing Association is working to expand that pilot throughout its tens of thousands of premises, which is excellent.

The investment that is being made is doing huge things to bring fibre to remote parts of the Highlands and Islands, which is also excellent. The current investment will bring normal services such as we have here to people who are close enough to the cabinets. However, many people in the Highlands and Islands are not close to the cabinets and we are missing any clear idea of how third parties other than BT will be able to use that infrastructure to provide locally and do things such as the Glasgow Housing Association is doing by having one big pipe and sharing it out. The access to that infrastructure is still unclear at best.

James Kelly: Thank you.

Alex Johnstone (North East Scotland) (Con): I am going to cover digital infrastructure, which is a subject that we have touched on many times. I will try to go through it fairly briskly without covering old ground.

I have heard what you have said and I think that I have got the message, to be perfectly honest. However, does the panel have any views on which digital infrastructure proposals in the budget will have a positive effect on our meeting the targets that have been set for greenhouse gas emissions?

Professor Fourman: Greenhouse gas emissions can be addressed by giving people the opportunity not to travel because they can do things virtually and by giving businesses the opportunity to use cloud computing that is provided by energy-efficient data centres instead of trying to do it themselves. It is easy to build a lot of computers—or even a fairly small number of computers—that consume a lot of electricity locally, but much more efficient use of the computational power can be achieved through good connectivity to a well-engineered data centre that uses energy much more efficiently. We have also talked about the impacts on transport, which certainly exist. Rolling out digital will help, but the problem is that our roll-out will not be complete under the current plans. In other words, not everyone in Scotland will have the opportunity to do those things.

Alex Johnstone: You mention the issue of transport. In an ideal world, everybody would work from home rather than commute. What do you see in the budget proposals that will drive that kind of change?

Professor Fourman: I do not see anything specific in the budget proposals that will drive that kind of change. Work on digital literacy is going ahead, and there is work with small and medium-sized enterprises to encourage the use of digital. That work will indirectly drive that kind of change, but I do not think that I have seen anything that is targeted at using digital to reduce carbon emissions.

Alex Johnstone: I will now ask an open question. We have already had some answers to it, but I will ask it anyway in case there are more—I do not want to miss this opportunity. What are the missed opportunities, in the budget, for digital infrastructure?

11:45

Professor Fourman: There is no new investment, although it is now well documented that we will be left with a residual problem when the current step change programme is finished. The amount of investment for dealing with the pieces that step change will not reach is minimal—it is of the order of £5 million. There may be a little bit extra now but it is tiny. A large number of households—in the order of 400,000—need to be reached. In fact, that number probably needs to be upped rather than lowered, given what we are beginning to know about how many people have long copper lines and so will not benefit from the speeds, even though they are connected to the fibre network.

Alex Johnstone: Have we come to the stage where we all know what could be achieved through digital infrastructure expansion but we do not seem to be doing much, other than carrying on the programmes that we have had for a number of years?

Professor Fourman: We are carrying on the programmes that we have. We have a strategic goal to be world class by 2020, but I see no mention of investment beyond the current plans, which are all part of what was around a few years ago. Those plans will do a lot of good stuff, but they will not complete the job.

Professor Anable: I will caveat what I am about to say by saying that this is not an area that I know a great deal about, and I wonder whether the committee might want to try to get some evidence on the issue in a different way. However, a lot of the digital discussion so far, and perhaps also the way that I saw it presented in the budget, has been targeted at rural issues and homes. If we

take the crossover between digital and transport, much of the potential lies in green logistics, for example with businesses and green freight. I suggest that the committee digs around in that a little in order to understand whether that is being targeted through the policies and expenditure.

Professor Fourman: That is absolutely right. The current programmes are pretty much exclusively targeted at domestic access, although they will have some side benefits for business access. However, the benefits do not come from people being able to stream video in the home. Although there will be poor people in the Highlands for whom it takes longer to download a television programme, the benefits come from businesses being able to access cloud computing or to have sensor networks that tell them what is going on. It is about transport networks being able to communicate effectively on the go so that businesses can have efficiencies in transport. It is those kinds of things.

At the moment, we do not treat the digital infrastructure as an infrastructure in the same way as we do with roads, rail and ferries. We think of it as a service to the home and, "Oh yeah, businesses get it, too." We do not think of it as an integrated infrastructure that enables communication between two points and in which there is a very open market, in that anyone can use it for all sorts of innovative things that we have not yet thought about. We are missing out on the opportunity to make the digital infrastructure open to innovation.

Alex Johnstone: I wanted to ask you about a slightly different issue. What are the panel's views on the transfer of funding for the next-generation digital fund to the rural affairs, food and environment portfolio? How will that affect the ability of the Infrastructure and Capital Investment Committee to monitor the effectiveness of current and future digital infrastructure programmes?

Professor Fourman: I think that it will take infrastructure out of the limelight and somehow devalue its importance. It certainly does not allow people to look at it and say, "This is actually national infrastructure we're talking about." It is saying instead, "There's a problem at the end of line. We'll let the people at the end of the line deal with it." I do not think that that is the right way to think about the problem.

Professor Roaf: Because the world is changing rapidly, we have energy prices fluctuating and climate change issues coming up. Energy is becoming scarcer and energy security is becoming much more important, and whole new industries are emerging in the wake of that, with what we call low-exergy energy approaches. That means that, whereas traditionally people took work to the energy—taking the grain to the mill on the

hill or the logs to the mill by water, for example—nowadays, with huge energy users such as data servers, there is a whole new movement. Google's major data server is north of the arctic circle, and it moves the data servers that have huge amounts of heat—

Alex Johnstone: You can cool it just by opening the doors.

Professor Roaf: Thurso is another place that has huge cloud potential. We have phenomenal potential in the north of Scotland for a whole new generation of cloud servers and services. We were discussing this the other day, because what is needed is energy storage to ensure constant energy, which will increasingly go off in the south of Britain. Thurso has been chosen because of investment with Norsk Hydro on tidal energy, so it has constant tidal energy, cold, and potentially huge amounts of fairly predictable energy from wind.

You probably know that in Lochaber in the north-west of Scotland, 93 per cent of all the energy is used by the Rio Tinto Alcan plant, which has a huge reservoir and constant water. We have opportunities to open up whole areas of Scotland for industries that want secure areas to develop, with constant energy, good schools and travel communications, but one of the things that is missing is assured digital connections. We need a major revision of what we offer industries by looking at infrastructure in that context.

Professor Fourman: A major competitor to us in that market is Iceland, which not only has cold to cool things down but has geothermal energy to produce electricity, and it is halfway between Europe and America and has good connectivity with fibre. A data centre in Iceland can be closer to Europe and closer to America than a data centre in London is to America or one in New York is to London. That really helps when you are doing arbitrage on the stock markets, so those data centres are important.

We have fibre coming in from Iceland telecoms at Durness. If you try to get a connection between Durness and Edinburgh, you find that no one wants to sell you one, because there is a monopoly, and selling one would open things up in a way that the current owners do not want. It is difficult to look at the whole of that infrastructure without also understanding the market. Once a motorway is built, anyone can drive a truck along it, but we have not ensured that that happens with the motorways that we are building for our digital infrastructure.

The fibre that is going in in the north-west is available for others to join at the end to provide to domestic premises but, as I understand it, it is still not opened up for connections to business

premises. Money can be made in providing it to the business premises, but until that can be done few people will want to invest. We have not opened up that infrastructure to make it a national infrastructure that provides connectivity between any two points. It should be the case that, once there is fibre there, we can get a decent price between Edinburgh and Durness, or between here and Oban, or anywhere else. There is a lot of fibre going in, but it will not be as open as it should be.

Alex Johnstone: Would it be fair to say that extending the digital infrastructure into every corner of the country does not make it rural infrastructure but still mainstream?

Professor Fourman: Absolutely. It needs to be still mainstream. What is more, if it is there and it is properly opened up, it will enable everyone to play the same kind of game as people in Edinburgh or in Shoreditch can play. Aardman Animations, the people who make the Wallace and Gromit films, are based in Bristol. Their big thing is that they need good connectivity not only through the fast pipes that they have to the States, but to the people to whom they farm out work—the illustrators and so forth who work for them. As well as their needing to be in an area where they have 100 megabits per second—in fact, they probably have a gigabit per second now—the people with whom they work need 100 megabits a second. The files that they push back and forth are enormous. With a fibre connection between the two places, those people could be in the north of Scotland.

Professor Roaf: You might be able to re- envisage the Black Isle or the Moray coast, say, as being a digital highway. It is not about some folksy little scene, with a kid getting a connection on a rural farm.

Professor Fourman: No. It is not about that, and the issue is not just about getting the stuff there; it is about ensuring that everyone has the right to use it.

In the 19th century, the issues with the rail network were exactly the same, and it took an act of Parliament to make it possible for trains to move from one train line to another. The lines were built so that their stations did not interconnect, because their owners did not want their competitors to take their business. It took an act of Parliament to push those things together, but we have not done that for the digital infrastructure.

The Convener: This is fascinating stuff. Cold is becoming important—that is amazing.

Professor Fourman: Cold is very valuable.

The Convener: Does anybody else have questions about digital infrastructure?

Jim Eadie: I wish to ask Professor Fourman whether we need an act of Parliament.

Professor Fourman: The problem is which Parliament would have jurisdiction over the matter.

Alex Johnstone: We are discussing that at the moment. *[Laughter.]*

Professor Fourman: I am serious. Access and openness is regulated by the Office of Communications. There are European Union conditions on openness to publicly subsidised infrastructure. I do not understand how what Ofcom is currently doing complies with the openness requirement in the state-aid approval that was granted for the broadband development UK project—BDUK—which includes the step change. I believe that that is currently an issue for Westminster. However, Parliaments can do what Parliaments manage to do, so who knows?

Jim Eadie: Tempted as I am to tease out a further response on that, I will move on to my own questions.

The Convener: Yes—if you could move on to your own questions, please.

Jim Eadie: I have a couple of questions to wrap up what I think has been an incredibly valuable evidence session. The first is about emissions targets, and the second is about innovation.

First, how confident are you that the current programmes and funding allocations to which the Government is committed will contribute to Scotland meeting its ambitious emissions reduction targets of 42 per cent by 2020 and 80 per cent by 2050? Do you feel that the shortfall in reductions arising from the failure to meet our targets in the years 2010 to 2012 is something on which we can make up ground?

Professor Roaf: That has not been taken seriously enough. On the point about a language for carbon accounting, which should be for everyone—from schoolkids to communities to businesses—we really need to develop a better means of accounting, and we need everybody to take part in that. There has not been enough expenditure on that in Scotland. Although we have sustainability and lots of other things funded, if we really want to do that, we need to develop a Scottish language and Scottish methods to account for it.

Professor Fourman: I am an outsider on the carbon debate, but I found the document on the carbon impact of the Scottish Government's activities fascinating. However, it does not tell us about the impact of the Scottish Government's activities on Scotland's carbon outputs. It specifically says:

“Second-round’ emissions ... are not recorded in the assessment.”

Without that, it might be interesting, and it is nice for someone like me to see that the Government is doing a good job, or perhaps not—we do similar things in universities—but in order to inform the budget in relation to the goal of reducing Scotland’s emissions, we need a document about the effects that those activities will have on Scotland’s emissions, but such a document is not there. Perhaps I am being naive, but that is how the situation looks to me.

Professor Roaf: I have made that point, too.

Francisco Ascuí: You are referring to the overall Scottish carbon account, rather than the draft budget, I assume.

Jim Eadie: My question concerns whether the allocations in the draft budget will allow us to fulfil the targets that have been set by the Parliament.

12:00

Francisco Ascuí: I think that we would all agree that there is more that can be done in many different sectors; we have talked about buildings, transport, digital infrastructure and so on.

I would say that there is a possibility that the targets will be met. I am not really able to say how confident I am about that, because that is about predicting the future, and it all depends on the effort that is put in and the leadership that is shown.

Jim Eadie: If we continue to do what we are committed to doing, will we be successful, or is a significant step change required?

Professor Anable: I can add to the discussion, although I will only be repeating what has been said. Sticking to transport, which is what I know, I do not see how the transport sector can pull its weight with respect to achieving the carbon reduction targets. There is a big reliance on uncertain policies—mainly around vehicle emissions and efficiency. That technology is coming along in leaps and bounds, but the rate of uptake and how it will be used is uncertain.

The transport sector is a difficult sector to do anything with in terms of carbon reduction because we have locked ourselves into car dependency and we have infrastructure that takes a long time to change. The problem is that we are perpetuating that through the policies that we are investing in.

Although some of the policies that we have discussed in terms of active travel, behaviour change and smarter choices might appear to have small impacts on total carbon reduction, the point is the degree to which we are going to be able to

rectify the situation quickly if we continue not to meet our targets. We need to think about building flexibility into our systems. That includes everything from people’s competencies and ability to exercise choices—even if they are not exercising those choices at the moment—to infrastructure that we can adapt quickly.

From what I have said, you might have gathered that my expertise lies on the behavioural side. The sort of work that I have done has shown clearly that people who are currently much more multimodal and less car-dependent are able to react better to disruptions—winter weather disruption, system breakdowns or whatever—and that their personal resilience is much better. We need to build that sort of thinking into our systems more generally. Even if we are not expecting people to change now, we need to ask whether we have in place things that will enable people to change quickly if we need them to do so in the future.

Francisco Ascuí: We should look at the issue in the global context. The world is not nearly on track to meet the target of a maximum of 2 degrees of warming; we are much more likely to be looking at 4 degrees of warming. Therefore, we should be realistic about the fact that the kind of changes that we need to make over the longer term are radical. They are completely unprecedented. Relative to the business-as-usual approach of a world that does not care about climate targets, the step change that we have to achieve is huge.

On year-on-year achievement of targets, there is a lot of uncertainty and volatility in the data. Achievement of the targets depends on economic growth to a large extent, and depends a lot on imported emissions from the rest of the world, because the imported emissions part of the total carbon budget for Scotland is the most volatile bit.

Therefore, I would not be too worried about missing a particular year’s target as long as the underlying actions were in place. It is much more important to lock in the lowest possible emissions in long-lived assets such as the built environment, transport infrastructure and, in the future, the digital infrastructure, than it is to achieve a short-term target.

Professor Roaf: Why are we not achieving the target? Scotland is producing nearly 50 per cent of the energy that it uses by distributed renewable energy systems. One problem is that while demand and supply are out of sync, we do not maximise the carbon benefits of the energy that we generate. We should be leading the world in carbon emission reductions. We need storage at all scales. We have mountains that we can use for double-pumped hydro. If we could introduce

storage into every house, we would reduce the need for peaky energy.

The one way to decarbonise an economy is to run it on renewable energy. Efficiency has been a great god in the past, but what matters is how we generate the energy to do the work, so we need renewables at every level. We need building-integrated solar systems for electricity and hot water, and we need community-integrated renewable energy systems and regional ones. However, that goes against the interests of the big six companies that run our energy systems.

If Scotland can emphasise getting maximum capacity and using the buildings to do it—getting maximum energy storage into the system—there is no reason why it cannot achieve its targets, because there is virtually nowhere in the world that is more blessed with free energy than Scotland. Eventually, markets will move industries to areas where there is cheap energy, and we can lead that, too, with the right digital infrastructure.

Jim Eadie: Thank you. That is fascinating.

The witnesses might have answered this question already in their answers to previous questions, but I ask them each to provide the one innovation—whether in policy development, infrastructure investment or good practice—that they think will have the biggest impact on reducing our greenhouse gas emissions.

Professor Anable talked about demonstration projects. Professor Roaf gave us a myriad of examples, from the decentralisation of local renewable energy supply to installing solar panels in houses in deprived communities and having more forward-looking building regulations that capture the emissions on the certificates that she mentioned. Professor Fourman alluded to infrastructure investments in the digital economy. However, what one measure out of all of the measures that have been discussed will have the greatest impact on reducing our greenhouse gas emissions?

I will go from my left to right.

Francisco Ascuí: Go the other way.

Jim Eadie: Okay.

Professor Fourman: It will be the opening up of the fibre infrastructure. We now have an internet exchange in Edinburgh, but if somebody in the west of Scotland wants to connect to that internet exchange, they must pay an arm and a leg for it because it is a long way away and they pay a distance-based charge. If people could connect to that exchange from anywhere in Scotland and then exchange data with others, that would change the digital economy in the country. Changing the digital economy will have wider effects, but it will also allow the various carbon-

reduction measures that we talked about to happen locally.

Jim Eadie: What investment is required to do that?

Professor Fourman: It is more a matter of regulation or cajoling than of investment. It is about getting people round the table and saying that we need Scotland to have the kind of market where people can access those things freely and competitively, rather than about putting in more stuff right now, because we have done a lot of putting in of stuff. We would then find that other places would want to connect and that the business case for making those connections would be stronger because more people would be able to use the connections.

Jim Eadie: Thank you.

Professor Roaf: It is a really simple solution: I would make sure that every house in Scotland had a solar power system on the roof and a solar hot water tank, because solar energy for a house not only provides free energy in perpetuity but changes mindsets, because it changes the way in which people see energy. Using solar energy in that way would reduce the total energy demand of Scotland by about 10 per cent. It would also mean that, for example, the people I know in Gorgie or Stenhouse in Edinburgh who never turn their heating on in winter—the real fuel poor, who are usually the elderly—would in winter have a reserve of heat, which would mean that they would not die of cold, which happened in 2010 to 2,500 people who could not afford to turn the heating on.

Jim Eadie: Okay. I will ask you the same question that I asked Professor Fourman. What level of investment would be required to roll that out?

Professor Roaf: I am sorry. I cannot give you the figure off the top of my head, but I will get one to you.

Jim Eadie: Okay. Thank you.

The Convener: You can send it to the committee.

Professor Roaf: Yes.

Professor Anable: I am tossing up which one of two examples to give you.

Jim Eadie: We will allow you to give two examples, if you really insist.

Professor Anable: Okay. First, in transport we must change our mindset about what we are aiming for. Most of the innovations to fix transport are not in the transport sector.

However, to answer your question directly, we need to think about rolling out car clubs more

widely. The change in mindset is to think about promoting access to cars rather than ownership of cars. It sounds quite simple, and in many ways it is. Places that have car clubs have seen them growing; Aberdeen has the fastest-growing car club. Edinburgh was the pioneer, but where clubs are being set up the rate of growth is quite phenomenal, although it is obviously from a very small base. That is something that we are doing already that I would like to see taken further.

Jim Eadie: Can you give an estimate of costs for that?

Professor Anable: No—I am not going to do that now. I will think about it and get back to you. I am not prepared to put a number to it at the moment, if that is okay.

Francisco Ascui: I am going to duck the question slightly—

Jim Eadie: We will see about that.

Francisco Ascui: —because there is no one thing that will do it all.

Jim Eadie: Perhaps we could prioritise for a purpose.

Francisco Ascui: Sure. We could ensure that all buildings across the country are zero-carbon buildings, but that would not be enough. We could decarbonise the electricity supply sector, but that would not be enough. We have to have innovation across the board. I guess that that leads me to saying that maybe the thing is to catalyse innovation and knowledge around this subject. I do not know what figure to give you for the investment that would be required for that. Scotland is already at the forefront of a lot of this stuff.

Jim Eadie: Can you be a bit more specific?

Francisco Ascui: It is about making Scotland a kind of silicon valley of low-carbon solutions for the rest of the world to look to. I think that we are already doing that in many different ways, but further—

Jim Eadie: Perhaps the University of Edinburgh could be offered as a laboratory for that.

Francisco Ascui: We are doing a lot at the University of Edinburgh, for sure. However, investing in the knowledge economy around low-carbon innovation is one of the things that would connect up the many different magic bullets that are needed in all the sectors.

Jim Eadie: Thank you.

Professor Fourman: Various centres and institutions, including Scotland's Rural College, are looking at, for example, carbon capture and storage. I am sure that none of them would object

to spending more money on their work and getting more brain power for it, and it might be worth doing that.

Francisco Ascui: Yes, but it is not just about research; it is about short pathways from research to implementation and getting much closer connections between innovation in the business community and innovation in the academic community.

Jim Eadie: Excellent. That has been very helpful. Thank you.

The Convener: There are no further questions, so I thank the witnesses very much for their very informative and useful evidence.

12:16

Meeting continued in private until 12:28.

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