



Science and Technology Committee

Corrected oral evidence: Role of batteries and fuel cells in achieving net zero

Tuesday 23 November 2021

10.00 am

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Members present: Lord Patel (The Chair); Baroness Blackwood of North Oxford; Baroness Brown of Cambridge; Viscount Hanworth; Lord Holmes of Richmond; Lord Kakkar; Lord Krebs; Lord Mitchell; Lord Sarfraz; Baroness Sheehan; Baroness Walmsley.

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Questions 122 - 134

Witnesses

Professor Gideon Henderson, Chief Scientific Adviser, Defra; Edward Barker, Director, Natural Environment, Trees and Landscapes, Defra; Janet Hughes, Programme Director, Future Farming and Countryside Programme, Defra.

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

Professor Gideon Henderson, Edward Barker and Janet Hughes.

The Chair: Good morning, everybody. Welcome, everybody; we particularly welcome our three witnesses. We are very pleased that you can join us today, and we look forward to the session. Welcome, Professor Henderson, Edward Barker and Janet Hughes. Dr Kennedy could not make it today because of urgent business. We are going to start. We are on a live broadcast. Each of the committee members will ask a question. Please keep the answers short, if you can, so that we can get as many questions as possible. We want as much information squeezed out of you as possible.

Q122 **Baroness Brown of Cambridge:** Thank you very much to our witnesses for coming today. The net-zero strategy from the Government recognises the importance of nature-based solutions, farming and land use in delivering net zero. Indeed, it targets a general range of a 70% to 80% reduction in emissions by 2050 for these areas, yet all of our witnesses in this inquiry so far have said that there is nothing like enough funding or focus to achieve this sort of significant challenge. We would like to hear about what initiatives and resources support the delivery of the key environmental targets that we have for trees, peatlands, agricultures and protecting land and marine environments in the net-zero strategy. Indeed, are those targets clear enough? Are we on track to achieve them? I would have started with David Kennedy so, Janet Hughes, I hope you will not mind if I start with you.

Janet Hughes: Not at all. Thank you very much for having me here today. I would like to pass on David Kennedy's profound apologies for not being able to be with you. He was unavoidably delayed. For the record, I am the director of the Future Farming and Countryside Programme in Defra, so I am responsible for all the work we are doing to phase out the common agricultural policy and introduce new ways to support farming productivity and environmental, climate and animal health and welfare outcomes.

I will talk about the funding and focus in the areas that I am responsible for and then, if I may, I will pass on to Edward to cover the other areas. Within the agricultural transition, there are a number of different ways in which we are intervening to support climate outcomes. First of all, we have three new environmental schemes: the sustainable farming incentive, local nature recovery and landscape recovery. I am very happy to go into some more detail about each of those. They support action at farm level, local level and landscape level. We are working on rolling those out alongside the existing schemes, which are already supporting action in these areas, and where we have seen a doubling of applications since 2018, so we are already seeing the farming sector stepping up and taking more action.

We are also supporting productivity improvements. That includes improving farm productivity and profitability while, in doing so, making

farmers more efficient and reducing their inputs through, for example, grants for precision technology; investing in better slurry management to reduce some of the emissions that come from that; and more sustainable use of slurry as a product rather than a waste, therefore reducing fertiliser use. There is a whole set of productivity interventions that we are supporting, on which we can go into more detail.

We are also supporting innovation in the sector, in particular on-farm innovation, including innovation that helps to reduce carbon emissions and improve climate change adaptation. We can go into further detail on that if you like. We are also supporting skills in the sector through investing in a new Institute for Agriculture and Horticulture, to support the sorts of skills that farmers are going to need in this age of needing to produce climate and environment outcomes alongside food outcomes.

Those are the main elements that we are involved with in the agricultural transition. Edward might add on the other aspects that were covered in the question.

Baroness Brown of Cambridge: Could I just follow up quickly, Janet, before we move on to the other areas? The net-zero strategy is setting a target of 75% of farmers to be engaged in low-carbon practices by 2030, and 85% by 2035. How will you know this is happening? What kind of emissions reduction will that contribute to? How do we quantify the impact of these measures that you are talking about?

Janet Hughes: We will know it is happening by measuring farmer participation in our schemes, primarily. We also have a farm businesses survey that we do annually, which can include collecting data on these sorts of practices. The sorts of practices that we will support through our schemes that are relevant to these low-carbon practices include minimum tillage or no tillage, not leaving bare soils, having diverse crops, looking after soil health, better slurry management, improved livestock health, reduced inputs and more trees in the farm landscape.

We can measure how much of that we are supporting through our schemes. We will also see through our monitoring and evaluation work what the wider adoption of those practices are because we are not the only ones promoting these practices; they are also being promoted through the supply chain, through membership organisations and through private investment. Our target is to have 70% of farmers in the sustainable farming incentive by 2028, and that will feed into this target of 75% of farmers in low-carbon practices by 2030.

In respect of the wider targets in terms of the outcomes of that, we are due to publish shortly some more specific targets, setting out what the contribution is that we expect agriculture to make to the overall effort share for carbon reduction. We will be publishing that in the next few weeks.

Baroness Brown of Cambridge: We are not going to have time for you to expand on the other things but, if there are notes you would like to send us afterwards, we would be very pleased to receive them. Can I move on to Edward?

Edward Barker: Thank you very much and good morning. I am the Director of Natural Environment, Trees and Landscapes in Defra. I am also SRO for the climate fund covering trees and peatlands, so I will focus on those two elements.

As you alluded to, we have the net-zero strategy and ambitious targets for both tree planting and peatland restoration within the net-zero strategy. We also had before that the 25-year environment plan. Now that we have the Environment Act in place, we will be setting targets that are also part of the framework within which we are delivering the Nature for Climate Fund. As well as looking to achieve net zero, we are also looking to contribute to increasing biodiversity and other environmental and green economy benefits.

On trees, we have the target of planting 30,000 hectares per year across the UK by 2025 as the most immediate target. We believe that that will require a tripling of the current rate of planting in England. We also have the target of restoring 35,000 hectares of peatland by 2025.

Over the past year, since the Nature for Climate Fund was announced, we have consulted widely with stakeholders, both on trees and peat, in order to inform and develop our action plans: the *England Trees Action Plan* and the *England Peat Action Plan*. We have also set up a programme and a portfolio of interventions to accelerate tree planting and peatland restoration ahead of the ELM coming into effect in a few years' time.

This year, we have been able to launch most of those projects over the summer. We have the early data coming in in terms of interest in taking up the various incentives. So far, it is looking promising for this year, and the intention is to ramp up significantly—[*Interruption*—those targets by 2025.

Baroness Brown of Cambridge: We are having a few problems with your connection, so I will move on to get some quick comments from Professor Henderson. I can see that my colleagues would like to ask some follow-up questions after that.

Professor Gideon Henderson: For the record, I am the Chief Scientific Adviser at Defra. I will add to the previous remarks, particularly with a more scientific basis.

First, it is worth mentioning that the term "nature-based solutions" means different things to different people. I am going to take your question as being narrowly about the carbon aspect of nature-based solutions. You commented on the aspiration in the net-zero strategy to reach 70% or 80% reduction in emissions from Defra sectors. I believe that there are four in the land use and agriculture area where we must really think deeply: trees, peat, biomass and emissions from meat production. Edward has already answered about trees and peat where there are set government policies and targets in place, and good action towards them. On biomass, the assessment of the potential at government level and target setting has not yet happened. On meat production, it is a complicated issue with cultural, social science and economic things tied up as well as carbon emissions.

In both of those areas, and across the net-zero patch, there is a need for more research and development to assess the best way of moving forwards. At the spending review, and as announced in the net-zero strategy, £75 million of R&D money was awarded to Defra to tackle those questions over the next three years. That will put us in a much stronger place to come up with well-evidenced ways forward for further reducing reductions beyond the targets that we already have in place and that Edward has summarised.

The Chair: My colleagues will now come in with their supplementary questions. Our time has almost run out for this question, but I elect Lord Holmes, then Lord Krebs, to ask quick questions.

Q123 **Baroness Walmsley:** Dr Hughes, you focused an awful lot on the percentage of farmers participating. Participation is not outcomes, and it could be very nominal. How are you going to avoid it just being nominal?

Janet Hughes: We are going to avoid that by selecting the actions that have the highest outcomes and that can give the biggest impact based on the science, and also selecting actions to fund that contribute to multiple actions. All of the actions that we fund are based on scientific evidence. We can make a reasonable assumption that, if people do those actions, we will—[*Interruption.*]

The Chair: You have frozen. I call Lord Krebs.

Lord Krebs: Thank you. This is also a question for Janet Hughes if she is still online. I hear a lot of talk about regenerative agriculture. Are the measures that you described what you would characterise as regenerative agriculture, with things like minimum till?

The Chair: Janet Hughes, are you back online? No? We will come back to that question. Can we move on to your question, Lord Kakkar?

Q124 **Lord Kakkar:** I would like to turn to the question of carbon storage and the co-benefits of nature-based solutions. We have heard much about this but we have also heard that there are outstanding scientific uncertainties, particularly in terms of resilience and carbon storage for habitats outside woodland. Is work being done to address these uncertainties, supported by Government? If so, what is that work?

Secondly, what efforts are being made to undertake some kind of baseline assessment of the potential for these different solutions, particularly in the agricultural and marine sectors, such that, if they were to be applied and invested, we would have a baseline from which to understand how effective these solutions turned out to be?

Professor Gideon Henderson: Thank you for the question. That is a fascinating area. I believe that the metrics internationally for trees and woodlands are reasonably well agreed. They are not perfect but they are pretty good. It is best to work internationally in that area. There is a commitment to continue to research and improve our knowledge of the metrics for carbon storage in trees.

Peat is a little less mature but we have a reasonable understanding of carbon storage in deep peat. This has really factored into international accounting only relatively recently, and there has been a push towards more accurate accounting as a consequence; certainly that is an area where we have done research in government. There is research going on in UKRI, and we plan, in both quarters, for more of the same.

Both of those sectors, before I move on to other habitats, have resilience challenges, particularly fire and pests, and potentially water-related challenges through drought or flooding. Those need to be factored in. We need to be aware of the climate change that will impact on them and the biosecurity issues but they do not undermine the overall value of doing them. Even if a portion of your woodland is burned at any time, other portions are not and you still have a net benefit, so you should not lose sight of the fact that they are still beneficial even if not 100% resilient, while striving for greater resilience at the same time.

Other habitats that you have mentioned, or at least hinted at, include things such as soil carbon or salt marsh or sea-grass carbon in a marine setting. In those sectors, I believe that the metrics to measure and understand them are insufficiently mature that you would want to count them at this stage in an offset market or in an accounting scheme. We would need to have greater assessment of them before we did it. That is an area of active R&D, and it will include a portion of Defra R&D in the near future. We must keep two critical aspects in mind in that R&D: additionality, in that it really is additional storage; and permanence, in that you are sure that the carbon is being locked up in a way that is resilient. I will leave it there but I am happy to say more if you have a follow-up.

Lord Kakkar: Is Defra research and development investment in that area being committed to, with funds available and programmes either about to be supported or currently supported?

Professor Gideon Henderson: Yes. As of the spending review announcement, we have £75 million of R&D spend in Defra over the next three years specifically focused on net-zero ambition. That was announced in the net-zero strategy. There is an accompanying document to the net-zero strategy that is not so well known but is also published: the net-zero research and innovation framework. That lays out in detail the aspirations of various government departments for the R&D needed to help reach net zero. There is a chapter in there on agriculture, land use and waste. Defra contributed heavily to that chapter. It is a cross-Whitehall document but Defra was heavily involved. The money we now have committed to R&D will be targeted at some of the areas in that chapter, including the things you have asked about.

Lord Kakkar: Is the amount that has been made available as a result of the spending review sufficient to address, in a timely fashion, the questions that we have just been discussing?

Professor Gideon Henderson: I believe it is but we will need to leverage it against other sources of R&D, and we will need to use it very efficiently. It was not as much as we had requested but it is an adequate

sum to make real progress on the major questions in the next three years. We will do so in close partnership with other groups, including UKRI, which also has a significant interest in this area.

Lord Kakkar: Thank you. Mr Kennedy, do you wish to intervene?

Edward Barker: I think you mean Mr Barker.

Lord Kakkar: I am so sorry.

Edward Barker: [*Inaudible.*] Briefly, since the Budget, we now have over £750 million in the climate fund, which includes some provision for R&D in support of the programme. [*Inaudible.*] We are also advised by an expert—[*Inaudible*—to keep our evidence base up to date.

Lord Kakkar: You broke up quite a lot in that response. Would you be kind enough to repeat it?

The Chair: We need to move on just now. We will need to come back. Janet Hughes, now that you are back, do you have any comment to make?

Janet Hughes: I am terribly sorry. My internet is normally very reliable; today, it is not serving me well. I apologise. I do not know whether you heard my answer earlier on about how we will know.

The Chair: Yes, we heard your answer to Baroness Walmsley. Do you have any comment to make on this question from Lord Kakkar?

Janet Hughes: In terms of baseline assessment, it is everything that Gideon said plus, as part of the schemes that we are putting in place, we are looking at how we can make best use of the funding that has been made available for a national natural capital assessment to inform both the design of our schemes and our understanding of the impact that they are having over time. We are also building baseline assessments into some of the schemes, for example of the condition of the moorlands right now, so that we can see over time what improvement is being made.

Lord Kakkar: Might we return to Mr Barker again, just to be clear, because we could not hear his response?

Edward Barker: I just want to add that, within the £750-million Nature for Climate Fund, we have provision for R&D support, so there is money allocated there for R&D. That is in addition to the scientific advisory group we have that advises on all aspects of the underpinning evidence and science for the Nature for Climate Fund. That is in addition to the funding that Gideon was speaking about.

Q125 **Lord Krebs:** Janet, can you tell us what is meant by “regenerative agriculture”? Is that the kind of low-carbon farming that you talked about in your comments a few minutes ago? I would also like to ask Gideon a question: is there an agreed methodology for measuring soil carbon?

Janet Hughes: There is not a definition of “regenerative agriculture” agreed by everybody, but there are a few founding and guiding principles for regenerative agriculture, which are very well aligned with the sort of farming we want to see. They are to do with minimising soil disturbance,

taking care of the soil, making sure there are living roots in the soil at all times and a diverse range of living roots in the soil, making sure that the soil is covered at all times, introducing livestock or other organic matters into your farming, and farming in a way that is suitable to your context. All of those things are relevant to what we are doing.

Where there are schemes that reflect the farming practices that we want to see, we are looking at how we can recognise that as part of our scheme. That involves things such as LEAF Marque, which is not badged as regenerative but is very closely aligned to it, and organic matters. We are working with regenerative farmers to see how we can support those practices that they are taking, because they do seem able to combine food production with climate and environment outcomes in exactly the sort of way that we want to see.

Q126 Baroness Sheehan: We are going to move on to the finance that is going to be necessary if the Government are going to meet their targets for nature and climate. Private finance is going to be really important in that. One way is through markets for carbon credit. I will ask each of you in turn. Professor Henderson, do you think that the markets are sufficient in scale to support the Government's headline targets and net-zero ambitions?

Professor Gideon Henderson: I should preface my remarks by saying that I am not an expert in green finance, so these are somewhat inexpert remarks. My perception is that there is a very substantial demand for the purchase of carbon credits at the moment. Many companies and industries have set ambitious climate targets and net-zero targets. Realistically, the only way they can meet them is by engaging in the climate finance market by offsets.

The money is available. The challenge is that there are not very many habitats where we are secure that there are carbon benefits. Trees and peat are probably the two exceptions where we really can measure and quantify the carbon benefits, and we have some assessment of the additionality and the permanence of those benefits. Many of the other habitats that we have touched on already in this session are much harder to measure and it is harder to be certain about the additionality and the permanence. Those include things such as soil carbon and many of the blue carbon areas.

In those settings, although there may be demand for offsets, we have to be very cautious about moving into that market. The significant danger is that you allow companies to buy credits that are not then secure into the future, and therefore allow them to continue to pollute in the present. It is an extremely important market but one that needs to be moved into with care.

Baroness Sheehan: Yes, it is. Do you agree that the business case for the nature-based solution is vital if we are going to succeed in the time available to us? In order to do that, we really need to have a clear scientific basis for quantifying the benefits of those nature-based solutions. Is enough being done?

Professor Gideon Henderson: I agree entirely on both metrics. We cannot do this with public money alone. We need private money in addition. It is absolutely critical that we have appropriate MRV—monitoring, reporting and validation—if we are going to do that in an appropriate way.

Baroness Sheehan: Is there enough emphasis on this in Defra?

Professor Gideon Henderson: It is fundamental to our research and development ambition. MRV is critical throughout that. We need to be able to measure the outcomes of any policy interaction that we make. That is true in the green finance area as much as it is with direct regulation or government incentives.

Baroness Sheehan: Just a quick yes or no: from your perspective, is enough being done to support the development and growth by the department?

Professor Gideon Henderson: I am not going to give you a yes or a no. We are doing work on it. We are doing more. More could always be done. You can always do things faster and more comprehensively. Government funding is coming into this area. One of the areas I touched on briefly was the need to leverage the government money. I mentioned UKRI earlier, but it is a valid point that leverage also needs to be with private investment into this area.

Janet Hughes: Just to add to what Gideon has said, we set some targets in the spending review for how much private finance we want to attract in. We said we were aiming to achieve £500 million a year by 2027 and £1 billion by 2030. Some of the work that we are doing to underpin that includes providing a framework, looking at MRV, as Gideon said, and seeing how we apply that to agriculture in particular, where we know it is less mature, as Gideon said. We are also looking at how to provide a framework for the market to operate so that everybody can see that there are fair rules to the game and a reasonable basis on which to participate.

We are also looking at how we crowd in private investment through our agri-environment schemes. The way that we have been investigating that is through our tests and trials. We have had 12 tests and trials looking at a number of different elements of this question of how you crowd in private finance. One is whether we can provide an aggregator platform so that, from a farmer or land manager perspective, you can see the full range of opportunities available to you on a particular piece of land. We have had some successful trials there.

We have been looking at private platforms, such as EnTrade, to see how they operate. They have very impressive and flexible schemes that farmers seem to like. We have been looking at governance. We have been looking at how payments should be set, including innovative payment mechanisms such as reverse auctions. We have also been looking at how we might pay for outcomes as well as actions.

We have learned a lot from those tests and trials. Everything we have learned from those will feed into the design, in particular, of the local

nature recovery scheme, where we think this is really relevant, as well as the landscape recovery scheme, where we are looking at how we can make sure that, at a landscape scale, when we are providing government investment, there is also private investment that comes in alongside that over a sustained period of time.

Baroness Sheehan: According to the Green Finance Institute's 2021 report, *The Finance Gap for UK Nature*, an additional £56 billion, on top of existing commitments, is needed by 2030. How are we going to reach that? What you have described is all very laudable but it is not going to cut the mustard really, is it?

Janet Hughes: We are going to achieve this through a combination of things. The Government's role in this is to help to provide the rules of the game and a framework for the market to operate in, in particular in respect of agriculture, where that does not currently exist. We also need to make sure that we have the right monitoring and validation in place, make sure that we are not crowding out private finance by accident through the design of our schemes and, instead, that we are crowding it in and we're doing tests and trials and live experiments on farms to find out what is going to work and accelerate the adoption of those practices that we can see working. We do that partly through our tests and trials, and also through our innovation, research and development work, as well as through our scheme design. Through that package of things, we believe we will be able to make the impact that we need to make on private investment in this area.

Q127 **Baroness Brown of Cambridge:** Professor Henderson says that trees and peat are the two areas where we can be confident of carbon storage. Why has the Government's net-zero strategy not agreed with the Climate Change Committee's recommendation that 100% of upland peat should be restored by 2045? Would that not be a sensible thing to have done?

Professor Gideon Henderson: That is not really a scientific question; I might defer it to my policy colleague, with apologies, Edward. It is a challenge that is being looked at. In general, how we restore peatland and how we can do it in a way that is economically and culturally sensitive is an area of active investigation. It is certainly something that we are looking at with the R&D budget in the near future.

Edward Barker: As Gideon was alluding to, we are taking a large number of measures to restore upland peat and, especially challengingly, lowland peat. We have the Lowland Agricultural Peat Task Force. We are taking measures to stop the burning of peat and to stop the use of peat in horticulture. As Gideon says, it is a complex and sensitive business. We have to proceed at as fast a pace as we can.

The Chair: Tongue in cheek, I am tempted to say that you should ask Professor Pete Smith, who is on the call, at another time. He might help you with that.

Q128 **Viscount Hanworth:** What is being done to ensure that nature-based solutions are designed in a way that maximises the co-benefits, beyond

carbon storage? Will there be detailed codes regarding the co-benefits, or will each project be judged on its own particular merits? If that is the case, which should be the agency to make those judgments? Perhaps I could start with Gideon Henderson.

Professor Gideon Henderson: I am happy to start but this, again, may be better answered by both of my colleagues from Defra in their particular areas. I would just like to start by flagging a word of caution about the use of the term “nature-based solutions”. You are, in this committee, using it very narrowly to mean carbon uptake by nature. In many other settings, that would be insufficient to classify it as a nature-based solution. Nature-based solutions are frequently required in discussions to have biodiversity benefits in order to classify as such. The use of that term implies that any system to take up carbon by nature would carry a co-benefit from biodiversity.

More generally, it is critical that any intervention takes into account not only carbon emissions but biodiversity, water quality, air quality, resource use and other factors as well; those are being looked at comprehensively for all schemes. For the individual schemes that Edward and Janet are responsible for, it is perhaps better to pass to them.

Viscount Hanworth: Edward Barker, how would these co-benefits be captured and how would they be rewarded? I have suggested that somebody might be working on a set of codes. Is that the case or, conversely, would each project be judged according to its own merits by some kind of tribunal of experts?

Edward Barker: Let me say a word, first, about the design of the Nature for Climate Fund, then I will give a couple of very brief examples. The programme, as I said at the beginning, is designed to deliver not only the net-zero target but also the environmental objectives. Everything is designed so as to try to maximise the benefits against those objectives. The choices of the programmes that are going to be funded or paid for through that fund will be influenced by the extent to which they meet that range of objectives.

I have two brief examples. The Woodland Carbon Code already requires compliance with the UK Forestry Standard, which covers a whole range of issues, including soil health, biodiversity, the historic environment and other matters. That is already integrated into the way in which the Woodland Carbon Code operates. We are investing £7.5 million into the Great North Bog, across a number of national parks and areas of outstanding natural beauty, to restore peatland. That will hopefully return that land to being a carbon sink, but it will also deliver benefits for water quality in the area. Quite a lot of what we are doing has that integrated into it already.

Viscount Hanworth: I am interested in the instruments that will be used to achieve these ends. In particular, how do all of these matters integrate with the schemes that Janet Hughes mentioned—the sustainable farming incentive, the land recovery scheme and local nature recovery? May I ask that of Janet Hughes? By the way, can she explain what is meant by “reverse auctions”? That would be useful.

Janet Hughes: I apologise for bringing jargon into the conversation. Reverse auctions are where the price is set by people bidding as to how much they are prepared to accept as a price for the work that is being done. It is used in the EnTrade application by water companies, and we have been experimenting with it in the programme as a way of setting a reasonable price that farmers are prepared to accept for doing things on their land. I will happily send you a note afterwards, just to set that out a bit more fully for you.

In terms of co-benefits, the way this works in different schemes differs. The way the sustainable farming incentive works is that it is intended to be accessible to all farmers. For that reason, it is quite straightforward. It has a list of standards and actions that you can undertake on your farm, and we will pay you a set price for those actions. That includes actions that have been prioritised because they contribute to multiple outcomes and have particularly high value for money for the outcomes we want to see in respect of our priority areas, including carbon reduction, biodiversity and water quality.

For SFI, we have chosen actions that, based on the science, we know contribute to multiple actions, and that is how we know we get co-benefits. We are also looking at how we reward a combination of actions that gets even better benefits than just one action on its own. That is why we aggregate the actions into standards containing multiple things to do. We know that, if you do all of those things, you have a better outcome.

On local nature recovery, we will be offering options for people, again based on a price that has been set to do the particular action, and again based on selecting those actions according to what has the highest impact. The difference in local nature recovery is that we will be supporting the right actions in the right place. We would be supporting, for example, wetland restoration in those particular areas where it is relevant or peatland restoration in peat areas.

Landscape recovery involves much more bespoke agreements. We will be asking people to put forward bids for long-term, large-scale land use change or habitat restoration. Those will be overseen by the relevant delivery bodies that have expertise in those areas, so Natural England in respect of biodiversity or the Environment Agency in respect of river restoration, for example. They will be assessing the quality of those bids based on an expert view as to what is likely to be effective. Again, in that scheme, we will be rewarding bids that contribute to multiple outcomes. We do not think it is a choice between supporting carbon or biodiversity; we want to invest in actions that support both of those things. That will be threaded through the design of all our schemes.

Viscount Hanworth: Will there be any problem of overlap between these three schemes and a scheme or project designed to generate carbon credits? How do you avoid double counting? How do you separate these endeavours?

Janet Hughes: The answer to that question is that we do not know yet. We want people to be able to stack different agreements on their land. In

the rules of the sustainable farming incentive, we will allow you to have agreements with private-sector buyers as well as agreements with the Government. There is an issue where we need to prevent people being paid twice for the same thing. Because these markets are nascent and the rules are not yet well established in those markets, we need to be developing this over time so that we can establish what the best way is to set the rules of the game in a way that crowds in private investment, rather than crowding it out, and allows people to stack different investments on their land.

The Chair: Time is tight. Lord Sarfraz, I know you raised your hand for a supplementary; perhaps you could include it in your question.

Q129 **Lord Sarfraz:** The net-zero strategy says: "Defra will develop a Farming for Net Zero resource, providing advice to farmers on good practice techniques to understand, manage and abate GHG emissions." What does that resource look like? How much budget has been allocated to it? How many advisers are going to work for it? What will be the farmer-to-adviser ratio? Will it be offline or online? Is it any good? Janet, would you like to start?

Janet Hughes: I apologise. I am not familiar with this piece of work. It is not in my area. I would be more than happy to provide you with a note afterwards. I do not know whether Edward is familiar with the piece of work in question.

Edward Barker: I cannot speak to that, but I could speak to what we are doing on skills, training and information on trees and forestry. Within the Nature for Climate Fund, we have a workstream around building sector capability. In addition to adding to the number of people we have in the Forestry Commission whose job it is to engage with people interested in tree planting and support them through the process, we are also looking at investing into the sector, working with sector skills councils to increase the number of foresters and people able to work in aligned areas over the years, because we certainly anticipate a significant increase in demand for people with those skills.

We are also investing in the supply chain in terms of nurseries where, again, there is going to be a greater demand in the future than in the past. We are looking to improve the provision of information to everyone involved in that supply chain, both nurseries and educational providers, so that they have a better sense of, and greater confidence in, demand in the future. That is an important stream in the Nature for Climate Fund.

Lord Sarfraz: If I am a farmer and I decide that I want to cut my greenhouse gas emissions, who is the first person I should call to understand how to do that? Who is going to help me throughout the process? Specifically, who is going to help me to understand how I can measure my greenhouse gas emissions in a manner that will be acceptable to buyers in the offset market?

Professor Gideon Henderson: You are not directing the question to anyone, and there is a silence here because none of us is particularly comfortable in answering that question. I suspect that the scheme you

are referring to in the net-zero strategy document probably relates to pending policy around the food strategy White Paper. The food strategy will incorporate thinking about environmental outcomes as well as dietary and production outcomes. This may be an area where David Kennedy would have been able to give a fuller answer than those who are on the panel. We might be able to follow up with information.

I can say briefly that there are a number of routes by which farmers can gather some of the information that you are mentioning already, before the new scheme is set up. Certainly, the NFU is one route into that sort of material. The AHDB also provides relevant material. There are many partnerships between external organisations, charities, universities and farming groups as well. There are metrics already, but there is more to do.

Lord Sarfraz: There is a lack of advisers and skills, training and on-the-ground experience available to help those who want to make these changes. That was the evidence that the NFU gave to us, which is why I am asking.

Professor Gideon Henderson: That is something we will have to follow up on in written evidence afterwards, unless Janet has anything to add.

Janet Hughes: I can add on the way that we are thinking about advice in relation to the schemes that we are introducing. There will be a mixed market of advice and a mixed economy of advice. We do not want people to have to take advice just in order to be able to fill in our forms or navigate our schemes. We need to make those as straightforward as possible. The guidance we provide about how to implement our schemes, again, should be as straightforward as possible.

However, we know that farmers need advice about what the right thing to do is and how to enter into this market. There are two aspects to that. One is advice that is provided by the private market. We are looking at how we in government support the further development of that market through training and skills, as well as possibly accreditation and other such measures.

We also know that farmers often look to other farmers for advice. Some of the work that we are looking at through the local nature recovery scheme is about how we support farmers to get advice from each other and how we support local facilitators and conveners that we know can have a hugely catalysing effect on activity in a particular area. We have a facilitation fund now where we fund local facilitators for that purpose. We are looking at what the successor arrangement to that is and how that should work.

That will complement the discussion groups that AHDB run, some of the things that the third sector runs and some of the private advice. There will be a mixed market and overall a mixed economy. We are trying to take a holistic look as to what the range of advice is that a farmer might need and where the best place is for them to get it.

The other important thing to say is that different farmers make different choices about this. I ask farmers I meet where they go to for advice, and

it is usually other farmers or people they know in their local area. That is the kind of local advisory infrastructure that we really need to support, rather than imagining that we can dole out advice centrally and that that will be helpful to farmers.

Lord Sarfraz: Just to clarify, Janet, you talked about facilitators. That is a very powerful resource. Does that also include training up brokers, project developers and all those folks close to farmers so that they can become master trainers?

Janet Hughes: Yes, that is right. Those local facilitators will play some of that role. I was just visiting one on Friday, and he plays that role in his local community. He is a broker and entrepreneur. He delivers some of the public goods but he is also upskilling all the people that he works with in understanding what they can do on their farm. I met a range of farmers with him on Friday. Some of them were running on their own now. Others are still just beginning on their journey. It is a hugely powerful role. If we can get a facilitator like that in every area of the country, we can really make a big impact.

Q130 **Lord Holmes of Richmond:** Good morning and thank you to our witnesses for taking the time. We have heard evidence, particularly from agricultural stakeholders, that there is policy uncertainty around the agricultural transitional plan and the environmental land management scheme, which will replace current agricultural subsidies. What is being done to give land managers the clarity they need to act now rather than having to wait for these schemes to mature?

Janet Hughes: I am very happy to answer that question; this is some feedback we have had directly from stakeholders as well. We are trying to strike a balance here between two things. The first is taking a test-and-learn approach, adapting as we go, responding to the science as it emerges and responding to developing policy as it emerges, which makes it impossible for us to say, right now, every single thing that we are going to do over the next seven years with any degree of accuracy or confidence. We do not want to provide false confidence, and we want to retain the ability to flex and adapt and learn as we go; we genuinely are doing that.

On the other hand, we recognise that farmers have long planning cycles and they need to be able to plan. Last year, we published the agricultural transition plan. We sent a leaflet to every farm in the country as well as through some of the trade press and membership organisations, so farmers will have received it several times. My colleagues and I were also out at the agricultural shows this summer, handing out that information. That gives an overview of all the changes that are coming.

The details that farmers really want to see are exactly how much they can get paid for what things and when. We are now moving into the phase where we are going to be publishing that information. We will very shortly be publishing some information about the sustainable farming incentive, which sets out in detail the rules of the scheme, how it will work, how it will work for tenants and commoners, and all of the

questions that we have been asked. It also has the particular standards that we will fund and how much we will pay for them next year, and the road map for standards beyond that.

We are also about to launch the first landscape recovery project. We will be setting out shortly, in detail, how we will be running that process, what the evaluation criteria will be and what the priority areas of investment are. We are also going to be publishing some information very shortly about the sorts of things we will invest in through local nature recovery.

There is more information coming—we have heard that feedback—but we will always be trying to strike this tricky balance between providing enough information for people to plan and not providing false certainty, which later turns out to be wrong and constrains our ability to do the right things in the right way as we go.

Lord Holmes of Richmond: Thank you. That is very helpful and comprehensive.

Edward Barker: It is clearly important for trying to motivate people to take up the opportunities in the Nature for Climate Fund now that they are sufficiently clear about the shape of environmental land management in the future. I am very conscious of the importance of getting this right, but Janet's team and mine are working very closely together on making sure that there is a seamless transition from the Nature for Climate accelerator into ELM, and that we communicate that clearly to those people with whom we are working.

Lord Holmes of Richmond: I appreciate that it is a policy rather than a specific scientific question but is there anything you would like to add, Professor?

Professor Gideon Henderson: I support Janet's nice summary of the basic problem here, in that we are still learning as we develop schemes. There is a balance between the need to be flexible and the desire to give enough information to landowners to be able to plan. That flexibility is particularly relevant in the area of carbon uptake, where we have a reasonable understanding from decades of previous research about the biodiversity, water quality and air quality impacts of some environmental interactions. We know a little less about the carbon uptake, and there is therefore perhaps even more need for flexibility in that particular area.

Q131 **The Chair:** I call Baroness Blackwood. Nicola, are you on the call? No? Perhaps we can see if she can get on the call.

Janet Hughes, if Baroness Rock had been on the call, she would have asked about tenant farmers and their short-term tenancy, and how landlords will behave in that situation to meet your environmental land management schemes. What are your plans to mitigate against that?

Janet Hughes: I have met Baroness Rock twice now to talk through these issues. She has been very helpful in offering feedback and pointing to where the issues are on that. I am very grateful for her input on it.

There are a range of issues relating to tenant farmers. The first is that we do not want to exclude them from schemes. In the current schemes, you enter into a five-year agreement or longer, and there is no flexibility within that agreement. If you leave early, you have to pay a penalty. Our new schemes will have a shorter scheme agreement length, and we will have some flexibility for those who, for some reason, lose management control of their land during the course of their agreement. We have also been looking at making sure that it is the active farmer—the person who is producing the public goods—who gets paid for the public goods to be produced.

We have had some really fruitful engagement with the Tenant Farmers Association, Baroness Rock and others about exactly how we design the sustainable farming incentive so that we can work around these very short-term tenancies. We have landed in a reasonable place there, but we will see how it goes and continue to monitor the take-up of the schemes by tenants to see if there is anything further that we need to do.

There are some more technical issues that Baroness Rock has raised with us, particularly around FBTs, which tend to have more restrictive types of contractual clauses in them. We are talking both to Tenant Farmers Association and the CLA about that set of issues, to see how we need to design our schemes to make sure that they are fair to all and that everybody can participate in them fairly. That is an ongoing conversation. I will not claim that we have finished answering all of the questions there, but we are alive to those considerations and keen to make sure that we make our schemes fully accessible and fair to tenants.

The Chair: Thank you. I think Baroness Blackwood is having difficulty in getting back on the call. Let me ask this question, which follows on well from what you have just said. We are making multiple demands of our land and land managers. Would it not be better if we had an overall strategy for the use of land? What grants do you have for that?

Janet Hughes: I will begin the answer and then hand over to Gideon, who will have views on this too. We have a strategic approach to land use, which we have set out in the things that we have published around the agricultural transition plan and the net-zero strategy. We will keep that under review. We do not think it is the right thing to do to set out specifically in detail exactly what will happen in each geographical location, because we want this to be a partnership between the Government and all the sectors that need to participate in this, where they also make choices within the framework and overall objectives that we set. That is the overall approach.

In terms of the land management schemes, that is how they work. We offer a range of options that, taken together, will be attractive to farmers and land managers and will achieve our outcomes. It is up to individuals on their particular plot of land as to what they want to do. We do not want to fund the wrong things in the wrong place. That is why we have the local nature recovery scheme: to make sure that we are doing appropriate things in each place. That is how we envisage it working.

Gideon, do you want to add something on that from a broader perspective?

Professor Gideon Henderson: Perhaps a little. We have land use policies. Both Janet and Edward have described some of those through the incentive programmes, the regulation programmes and from the care that is taken to make sure the right thing goes on in the right place. Whether there is merit in integrating all of those policies into a cohesive strategy or not is something of a political question. In the current situation in the UK, land is, to a very large extent, owned in ways whereby individuals will choose to interact with policies in their own way. It speaks back to what Janet has just said: we need to bring those sectors with us and have policies that are relevant to each of those sectors.

I believe that there will need to be new policies going into the future, particularly around the carbon mitigation issue that you have been focusing on in questions today, given the relatively flat line of greenhouse gas emissions from the agricultural sector in the last decade and the need to decrease that in the coming years. We will need new policies there. Whether that is packaged in a strategy or not is less important than the need for policy.

Edward Barker: I mention in passing that, yesterday evening, I was at a lecture where the Archbishop of Canterbury was talking, among other things, about the Church's strategy to manage its 200,000 acres of land across the country. Many of our conversations with major landowners reflect the fact that many organisations and individuals outside government are also thinking about this, and quite a lot of the answer probably lies as much with them as it does with government.

As Janet has alluded to, the local nature recovery strategy that will come in following the Environment Act should be quite an important means of bringing together national priorities set out through the environmental improvement plans and targets, with local understanding of the opportunities in those areas and improved mapping. That is another area that we are investing in that will help us to make more strategic decisions about land use at a local level but informed by those national priorities.

The Chair: I wonder if you have a comment about the concerns, Professor Henderson, that, if any of these strategy plans do not work, the UK will then offshore this carbon requirement.

Professor Gideon Henderson: That is a live concern. It is something that people across government are very aware of. We monitor not only production emissions but also consumption emissions. Defra publishes results, which are used by the Climate Change Committee and others, on consumption emissions. It is fair to say that they have not fallen as much as production emissions in the UK, although they have fallen. This is an area where we will need continued vigilance into the future.

A word of optimism here is that, as many more countries establish net-zero ambition, offshoring will become more challenging with other countries also striving to lower their own emissions. That does not take

the pressure off the UK needing to balance its own books and be aware of the implications of trade. When thinking about the consumption of something, we need to couple that with our consideration of production. Where is it produced as we are consuming it? That is a somewhat waffly answer but we need to be really alive to this issue.

The Chair: I am pleased that you are concerned about these comments. It is a good answer in that respect.

Q132 **Baroness Brown of Cambridge:** In the Climate Change Committee's work, the hard-to-mitigate sectors that need these carbon offsets, which are going to be provided by, for example, tree planting, include a lot of aviation emissions. I sense from what people have been talking about here that Defra seems to be assuming that most of these offsetting emissions are going to be needed to be used for offsetting agriculture. Have we decided where the hard-to-mitigate emissions that are going to be offset are? What is Defra's assumption about that?

Professor Gideon Henderson: The apportionment of required emissions reductions has been distributed by BEIS and handed to individual government departments to meet. The setting process that you have just described is currently handled by BEIS. My understanding is that it has broadly followed the Climate Change Committee's guidance in the way that it has apportioned those emissions reductions. Defra's challenge, given that you are talking to Defra officials, is set by BEIS, and then we are considering how to meet that objective. It is not in our power at Defra level to decide who we use our trees to compensate for.

Baroness Brown of Cambridge: Thank you; that is very helpful.

Q133 **Lord Krebs:** I want to come back to Gideon on my question: is there an agreed method for measuring soil carbon?

Professor Gideon Henderson: Yes, there is, and it is physical. You sample it and measure the organic carbon in that soil. There are challenges both in terms of the depth to which you measure and how much you consider to be the active layer, as well as particularly to do with the spatial variability within a field. Sampling at one site may not give you a very representative view of the whole field.

It remains a challenge to do it well. It is quite labour-intensive. I believe this is an area where there could be a real revolution from some technical innovation. For instance, the technology called eddy covariance, which measures both the direction of air flow and the gas composition, enables a much better assessment of the uptake of carbon but is really expensive at the moment. If that technology or other technologies could be brought to bear to make soil carbon much easier to measure, that would be really interesting and useful. At the moment, it is very labour-intensive but there are agreed metrics.

Q134 **Baroness Walmsley:** We have heard that there is a tremendous demand for offsets. Does it not worry you that there is such a demand for offsets and that people are more interested in taking part in all these

schemes that you have been talking about to offset their emissions rather than reducing them?

Janet Hughes: I do not think that is the case, from the farmers that I meet and interact with. They are not just seeking to offset. They are seeking to reduce their emissions meaningfully. That is not all farmers, but the NFU has committed to a net-zero strategy, and lots of farmers that I meet are committed to reducing their own emissions before they then provide any offsets for others. There is a policy question about how we manage that and where we see the boundary between individual farms getting down to zero first before selling offsets; that is policy still to be determined. It would not be fair to say that the entire focus is on offsets.

Baroness Walmsley: I was really referring to those who buy them.

Janet Hughes: I would not presume to comment on those who buy them. That is well outside my remit.

Professor Gideon Henderson: It is essential that there is a market that draws in private finance to the climate problems. We will not solve it by government spending alone. It is good that there is that drive for green finance in the carbon space. You hinted at the level of concern. I certainly have concern if those offsets are not high-quality offsets with additionality and permanence, in which case they would basically be a sticking plaster while other industries continue to pollute. That is a concern that we have to watch out for quite scrupulously in our schemes.

The Chair: We are bang on time. Thank you very much, all three of you, for helping us today. One or two of you commented that you might have some other evidence. We would be pleased to have it. Please send it in. We very much welcome that. You will see the transcript of today's evidence session. If any correction is necessary, please let us know. Apart from that, thank you very much indeed for making time today.

Janet Hughes: Thank you for having us.

The Chair: It is our pleasure. We might have you again another time. Thank you very much.