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Rural Economy and Connectivity Committee Comataidh Eaconomaidh Dùthchail is Co- cheangailteachd

Report on the Draft Climate Change Plan - the Draft Third Report on Policies and Proposals 2017-2032



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Rural Economy and Connectivity Committee

To consider and report on matters falling within the responsibility of the Cabinet Secretary for the Rural Economy and the matters falling within the responsibility of the Cabinet Secretary for Transport, Infrastructure and Connectivity.



<http://www.scottish.parliament.uk/parliamentarybusiness/CurrentCommittees/rural-committee.aspx>



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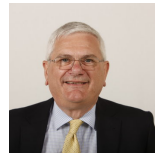
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Executive Summary

The Scottish Parliament took a collaborative approach to the scrutiny of the Draft Climate Change Plan (CCP) 2017 across a number of subject Committees. The Rural Economy and Connectivity Committee considered the CCP in relation to Agriculture, Transport and Forestry. A summary of its main conclusions and recommendations are included below.

Overarching conclusions

- The Committee is of the view that the time frame allowed for scrutiny of the draft Plan is restrictive. It calls on the time frame to be reviewed and suggests that at least 120 days are allowed to ensure thorough scrutiny.
- Unlike previous Plans the draft does not include baseline data or details of the specific emission reductions attributable to each policy or proposal. This made it harder for the Committee to effectively scrutinise and understand their relative significance and contribution.
- There is a significant lack of financial information provided in the draft Plan. The Committee calls on the Scottish Government to provide additional detail on the funding expectations of each specific policy and proposal.
- The lack of a complete monitoring and evaluation framework and SMART targets hampers the Committee's ability to quantify the contribution of each measure or to read across the previous documents to compare progress. It notes that an updated performance framework will be delivered later in 2017.

Agriculture

- The Committee recognises that in order to achieve climate change targets the goodwill of farmers and land managers must be ensured. However, it notes the conclusions of many stakeholders that the Draft Climate Change Plan is not ambitious enough and that some proposals lack a level of detail. It is encouraged that the Scottish Government committed to consider how it may include more specific and measurable detail in the final draft of the Climate Change Plan.
- The Committee calls on the Scottish Government to consider how greater recognition can be given in the final Plan to those in the agriculture sector who are already making positive efforts to mitigate climate change through such measures as forestry, peatland restoration and renewable energy.
- While recognising the strongly expressed view of the farming sector that voluntary measures to achieve greater climate change mitigation are preferable, the Committee believes that it is reasonable and sensible for the Scottish Government to be ready to consider alternative approaches should this approach prove insufficient.
- In relation to advisory services the Committee calls on the Scottish Government to consider how best it can use existing financial support or incentives in order to ensure this knowledge can be put into practice.

- The Committee urges the Scottish Government to be more ambitious regarding targets for carbon audit uptake and make public the detail on how it plans to implement its carbon audit roll out up to 2032.
- The Committee calls on the Scottish Government to consider reviewing the procedure for tenancy 'ingo' and 'waygo' valuations so investment in soil quality can be properly accounted for.
- The Committee would encourage the Scottish Government to be more ambitious and to create a Nitrogen Budget for Scotland.
- The Committee notes that there was a lack of focus on organic farming, consideration of demand side measures or conservation tillage where this is appropriate, in the Draft Climate Change Plan. It calls on the Scottish Government to consider their inclusion in the final draft.

Transport

- The Committee recognises that since 1990 progress in emissions reduction from the transport sector has been largely offset by increases in demand. It therefore recommends that greater consideration is given to policies that will control demand and encourage modal shift away from private cars.
- In relation to Scottish TIMES, the Committee highlighted that more information on the traffic growth figures input into the model is required to better understand the policy and proposal outcomes.
- The Committee notes that the Draft Climate Change Plan focusses on ways in which developments in technology will reduce transport emissions. The Committee recommends that detail is provided on any incentives proposed and the costs associated with encouraging uptake of ultra-low emission vehicles.
- In relation to active travel, the Committee calls on the Scottish Government to set out how it intends to meet its walking and cycling modal shift commitments, in particular 10% of everyday trips by bike by 2020, in the final Climate Change Plan.
- The Committee recommends that policies to incentivise bus patronage are outlined in the Plan. It also recommends further and increased support for the development of walking and cycling infrastructure to allow for integrated active travel and public transport journeys, with a view to encouraging modal shift from private cars.
- The Committee notes that the proposed reduction in air passenger duty could have a negative impact on carbon levels and recommends that the Scottish Government should commit to undertaking and publishing an analysis of this likely increase in carbon emissions from aviation.
- The Committee calls on the Scottish Government to develop the very limited section on land-use and planning to integrate a climate change impact assessment into planning decisions, weighing economic benefit with the overall ambition of reducing carbon emissions.

Forestry

- The Committee notes that progress since the last Climate Change Plan in 2013 has been slow and that the Scottish Government has failed to meet its forestry targets. However, it acknowledges that the Scottish Government has accepted the recommendations as set out in the Mackinnon report to improve and streamline the forestry industry and to help achieve its planting targets.
- The Committee notes the explanation from the Scottish Government regarding how much CO2 the planned planting targets are anticipated to capture. It calls on the Scottish Government to clearly set out this anticipated figure in the Climate Change Plan.
- It also calls on the Scottish Government to give greater consideration to the research required into the benefits of planting the 'right tree in the right location' in order to achieve optimum carbon capture.
- The Committee noted that there was a lack of focus in the Draft Climate Change Plan on how the Scottish Government will positively manage our existing woodland, the competing subsidy regimes for encouraging farmers into agroforestry and the integration of land-use plans. It calls on the Scottish Government to consider their inclusion in the final Climate Change Plan.

Climate Change Act 2009 and reporting requirements

1. The Climate Change (Scotland) Act 2009 (the Act) was passed by the Scottish Parliament in June 2009. It is a requirement of the Act that the Scottish Government must produce regular reports on its policies and proposals to meet Scotland's annual climate change targets. The first version of this plan, "Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022: The Report on Proposals and Policies", often known as RPP1 was published in 2011. The second plan, "Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027: The Second Report on Proposals and Policies", known as RPP2, was published in 2013.
2. The Act explicitly sets out what is expected from all reports on proposals and policies. It states that such reports must, in particular, set out:
 - the Scottish Ministers' proposals and policies for meeting the annual targets;
 - how those proposals and policies are expected to contribute towards the achievement of the interim target, the 2050 target and, in each target year, the domestic effort target; and
 - the timescales over which those proposals and policies are expected to take effect.
3. The draft report must also address how energy efficiency, energy generation, land-use, and transport will contribute to meeting the annual targets as well as how the proposals and policies set out in the report are expected to affect different sectors of the Scottish economy. Crucially, each draft report must contain an assessment of the progress towards implementing proposals and policies set out in earlier reports.
4. Before laying the final report before the Parliament, Scottish Ministers are required to have regard to:
 - any representations on the draft report made to them;
 - any resolution relating to the draft report passed by the Parliament; and
 - any report relating to the draft report published by any parliamentary committee.
5. The final report on proposals and policies must identify the changes (if any) that have been made in response to such representations, resolutions or reports and the reasons for those changes.

Parliamentary procedure for consideration of the Draft Climate Change Plan

6. The Draft Climate Change Plan - the draft Third Report on Policies and Proposals 2017-2032 was laid in Parliament on 19 January 2017. Under provisions of the Act, the Parliament has a maximum of 60 days to report on the document. It is open to any committee to consider relevant aspects of the draft CCP and report to the Parliament, after which there will be a parliamentary debate.

Committee consideration

7. The Committee agreed to take a coordinated approach to the scrutiny of the draft Climate Change Plan (CCP) across a number of interested subject Committees. While the Environment, Climate Change and Land Reform Committee operated as lead each subject committee was responsible for scrutinising policies and proposals within its own remit. The Committee Conveners agreed to issue a joint call for views and to work collaboratively on stakeholder communications, engagement and media work. Conveners also agreed to hold a joint Chamber debate on behalf of all scrutinising Committees.
8. An outline of the committees' areas of focus is set out below:
 - **Environment Climate Change and Land Reform** – Overview, development of RPP3, climate change governance (including monitoring and evaluation), water, resource use, land-use (including peatlands and land-use by the public sector) and behaviour change;
 - **Rural Economy and Connectivity** – Rural affairs, agriculture, forestry, and transport.
 - **Economy, Jobs and Fair Work** – Reducing energy demand, renewable energy (renewable electricity and renewable heat) and interconnection and grid issues and fuel poverty;
 - **Local Government and Communities** – Local government, planning and housing

Key questions

9. A number of overarching questions were agreed by the committees to structure scrutiny of the Draft Climate Change Plan. These were as follows:
 - What is the progress to date in cutting emissions and implementing the proposals and policies set out in previous Climate Change Plans?
 - How appropriate and effective are the proposals and policies within the Draft Climate Change Plan in order to meet the annual emissions targets and contributing towards the 2020 and 2050 targets? What is the scale of the reductions proposed? Are they appropriate?
 - How appropriate are the timescales over which the proposals and policies within the Draft Climate Change Plan are expected to take effect?
 - What is the extent to which the proposals and policies reflect considerations about behaviour change and opportunities to secure wider benefits (e.g. environmental, financial and health)?

Written and oral evidence

10. The Rural Economy and Connectivity Committee issued a call for views on 19 January which ran to 10 February. It received 49 written submissions which are available at Annexe B. Nine were on agriculture, three on forestry and 21 on transport.

The Committee held oral evidence sessions on 1 February, 8 February and 22 February. A list of all participating stakeholders is available at Annexe A.

Approach to the report

11. The Climate Change Plan contains a range of policies, proposals and milestones relevant to the Rural Economy and Connectivity Committee remit. The Committee acknowledges that there may be areas of broad agreement and consensus on a policy approach which it and stakeholders may welcome. However, it notes that the intention of this exercise is to work constructively with the Scottish Government to provide scrutiny and comments on how the final draft of the Climate Change Plan may be improved. As such, the Committee focuses its attention within this report on those areas which were the subject of representations from stakeholders and on which it feels further attention or consideration is required.

Overarching conclusions

12. The Committee has made a number of overarching conclusions and recommendations which it feels are relevant across all areas of interest - agriculture, forestry and transport.

Time available for scrutiny

13. The Climate Change (Scotland) Act 2009 sets out a strict 60 day deadline for Committee scrutiny. The Committee is of the view that this is restrictive and does not allow for the depth and breadth of scrutiny required in such a technically complex and important area of government policy.

14. The Committee calls for the time frame permitted for parliamentary scrutiny under the Climate Change (Scotland) Act 2009 to be reviewed as part of the upcoming climate change bill. It suggests that at least 120 days are allowed to ensure thorough scrutiny.

The TIMES model

15. In producing the plan the Scottish Government commissioned an energy model, referred to as Scottish TIMES. The model is designed to identify the emission envelopes and interventions within each sector that would achieve the required emission reductions at the least cost across the economy.
16. The Scottish Government has also used a wider set of considerations to limit or 'constrain' the model. However, the Committee notes that the CCP does not provide further details of any specific constraints, for example specific policies or proposals that were ruled out as a result of concerns about political or public acceptability or ability to deliver.
17. The document also indicates that emission envelopes for agriculture, forestry and transport were developed "exogenously" (separately) and then added into the model. This appears to differ from the approach taken in other sectors. In relation to transport the Scottish Government advised that the model used Element Energy (EE) research commissioned by Transport Scotland which contains sector-specific modelling of the Scottish transport sector. In relation to agriculture and forestry the TIMES model is required to utilise supplementary models to take into account the analysis of non-energy (e.g. biological) emissions and sequestration. This is because the TIMES model focuses on CO2 emissions that arise from fossil fuels.
18. Unlike previous Climate Change Plans (RPP1 and RPP2) the draft CCP does not include details of the specific emission reductions attributable to each policy or proposal.

19. The lack of baseline data or the specific emission reductions attributable to each policy or proposal makes it harder for the Committee to effectively scrutinise and

understand their relative significance and contribution to the Draft Climate Change Plan.

Funding

20. The TIMES model is designed to identify the emission envelopes and interventions within each sector that would achieve the required emission reductions at the least cost across the economy. However, there is a significant lack of information provided in the Climate Change Plan regarding the funding expectations and requirements of each specific policy and proposal.

21. The lack of financial information available in the Climate Change Plan makes it difficult for the Committee to establish the relative merits of policies, to pursue any cost benefit analysis or establish whether sufficient funding will be invested. The Committee calls on the Scottish Government to provide further detail and financial information on the anticipated costs associated with its plan.

Monitoring and evaluation

22. In their 2016 report on Scotland's progress in cutting emissions the Committee on Climate Change state that:

” We have found that in a number of areas there is no evidence of whether, and to what extent, actions are helping to achieve emission reductions set out in RPP2. Without monitoring and evaluation, it will not be possible to know whether the policies are having the desired effect and any money is being spent well.

Source: Committee on Climate Change, 2016¹

23. Although the Draft Climate Change Plan contains a proposed approach to monitoring and evaluation it does not include a completed framework. It is noted that an update on the performance framework will be delivered later in 2017 alongside the final Climate Change Plan. The final version of the framework will then be published in 2018.

24. The lack of a complete monitoring and evaluation framework hampers the Committee's ability to quantify the contribution of each measure against targets or to read across the previous documents to compare progress. It notes that an updated performance framework will be delivered in 2017. It calls on the Scottish Government to include in this framework clear plans for when policies and proposals will be implemented as well as measurable SMART targets, progress indicators and milestones.

Agriculture

25. Agriculture relates to farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.

Progress to date

26. The Committee on Climate Change is an independent, statutory body. Its purpose is to advise the UK Government and devolved administrations on emissions targets and report on progress made in reducing greenhouse gas emissions and preparing for climate change.
27. According to the Committee on Climate Change, emissions from agriculture and related land-use make up the third largest emission sector (after energy supply and transport) with 23% of emissions. Within this, agriculture accounts for a 19% share and land-use (including forestry) accounts for 4%. Between 1990 and 2014 emissions from the sector fell by 25%, however, the Committee on Climate Change has stated that reductions in the sector have not occurred at the rate required to meet targets. This fall is mostly attributable to four factors:
- efficiency improvements in farming, such as higher milk yields per cow;
 - fewer cattle and sheep;
 - a reduction in the amount of nitrogen fertiliser being applied; and
 - a reduction in grassland being ploughed for arable production.
28. In their [recent progress report](#) the Committee on Climate Change has noted that while the Scottish Government are in the process of implementing many recommendations from their previous report ‘...there are notable exceptions in agriculture’. ¹ As noted above, between 1990 and 2014 emissions from the sector fell, however they still account for 23% of Scotland's total emissions.
29. The Committee explored with witnesses the progress made to date in reducing carbon emissions within the agriculture sector and delivering the proposals and policies outlined in the previous climate change documents (RPP1 and RPP2).
30. Scotland's Rural College (SRUC) noted in written evidence that progress in cutting emissions from the agriculture sector has slowed in the past four years and that, in the most recent reporting year (2014), there was a small rise in nitrous oxide emissions. It also stated that, historically, falls in emissions from the sector have not been as a result of direct climate policy interventions. It argued that in order to deliver the scale of emission reductions required by policies there is a need for the development of additional interventions.
31. As an example, SRUC highlighted Farming for a Better Climate, the main policy for agricultural decarbonisation set out in RPP2, which aimed to achieve around 50% uptake for most measures in five key areas. SRUC suggested that, although RPP2 included developing a monitoring framework for the uptake, there is as yet no

indication of progress being made in either the comprehensive monitoring of policy effectiveness or the uptake of the measures.

32. In defence of the sector, Professor Pete Smith from Aberdeen University noted that agriculture is a more difficult sector to decarbonise than others included in the plan. He suggested that in other areas decarbonisation is possible by using less energy and fewer fossil fuels. However, in agriculture, nitrous oxide and methane are large components of the greenhouse gas balance and it is more challenging to reduce those emissions. He said—

” It is not just a matter of decarbonising the energy that we put in; there are biological processes to be considered. In particular, the enteric fermentation that occurs in ruminants produces methane, and there are nitrous oxide emissions from nitrogen in the soil, whether that is through mineral or organic applications.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Professor Smith, contrib. 177²

33. The National Farmers' Union of Scotland (NFUS) supported this position in written evidence. It said that, unlike all other sectors apart from forestry, agricultural emissions are in large part due to biological (rather than chemical or mechanical) processes. It also suggested that although baseline data and monitoring of such processes are improving they are far from ideal and mitigating biological emissions is very challenging.
34. NFUS also noted that the 'agricultural carbon envelope' in the current system does not take account of farmers and crofters sequestering carbon via management of forestry and peatlands, nor the generation of renewable energy. This is due to the Intergovernmental Panel on Climate Change guidance on how to calculate emissions and sequestration, and the ensuing UK Greenhouse Gas Inventory which does not include such activities. Therefore these elements of farmers' activity to mitigate climate change are not being directly attributed to the sector.
35. In giving evidence to the Committee, the Cabinet Secretary for Rural Economy and Connectivity ("the Cabinet Secretary") acknowledged this issue and agreed that it was important that all the work undertaken by farmers in relation to climate change mitigation is recognised. He suggested that it might be possible to give credit to farmers for this contribution in the agriculture section of the Climate Change Plan.

36. The Committee acknowledges the inherent challenges in decarbonising the agricultural sector. However, it is also aware of the need for concerted action if Scotland is going to meet its ambitious climate change targets. In addition to the conclusions on monitoring and evaluation above, the Committee calls on the Scottish Government to consider how greater recognition can be given in the Climate Change Plan to those in the agriculture sector who are making positive efforts to mitigate climate change through such measures as forestry, peatland restoration and renewable energy.

Proposals and policies

37. The Draft Climate Change Plan states that the Scottish Government's ambition is for Scotland to be among the lowest carbon and most efficient food producers in the world. However, it was noted that the agriculture sector has one of the lowest targets for change and is one of the least ambitious in the Climate Change Plan. Anticipated emissions from agriculture, for example, are expected to fall by 0.9MtCO_{2e} or 12% by 2032. This is the smallest proportional reduction of any sector in the plan and significantly less than the Committee on Climate Change's recommendation of 1.5MtCO_{2e} reduction by 2030.
38. In addition, Stop Climate Chaos noted that in the draft CCP there are no policies set out beyond 2025 for the agriculture sector; despite it being a requirement in the Act that the plan show how all annual targets will be met for the period 2017-32.
39. SRUC stated in written evidence that, with regard to the 2050 targets of zero net emissions, the draft CCP could be more ambitious. It suggested that policies and proposals currently set out in the draft CCP might be insufficient to bring down agricultural emissions enough in the longer term to achieve this target.
40. In written evidence, the RSPB stated that in analysing the policies in the agriculture chapter it is very difficult to make a judgement as to whether they will credibly assist in meeting the proposed ambition. In its view, this is because they are written vaguely, rely on future discussion with stakeholders, or include timetables for action containing descriptions rather than uptake numbers.
41. Witnesses were questioned on the views regarding the time frame set out in the plan. Detail will be given where appropriate when the report goes on to discuss individual policies. However, overall, where it was possible to comment most stakeholders were content with what was proposed. For example, SRUC noted that the timeline was feasible and the Soil Association welcomed the combination of a longer term vision with shorter term detail on specific policies used in this plan.
42. The Cabinet Secretary said that the sector requires a distinctive approach and that there are no easy options. He said—
- ” If we create an impression among farmers that climate-friendly farming is something that is being done to them through inspections, enforcement and penalties, they will turn against all the other steps that we want them to take. We cannot significantly reduce emissions from agriculture without the good will of the actual custodians of the land.
43. The Committee challenged the Cabinet Secretary on the level of measurable detail and specific targets available in the draft CCP. He responded that he was happy to consider suggestions by the Committee in areas where further progress could be made and if the plan was able to be more specific that would be a positive step.
44. As discussed above, the Committee acknowledges that the agricultural sector presents some inherent challenges with regard to climate change mitigation and it recognises that in order to achieve climate change targets the goodwill of farmers and land managers must be ensured.

45. However, it notes the conclusions of many stakeholders that the Draft Climate Change Plan is not ambitious enough and that some proposals lack a level of detail. It is encouraged that the Scottish Government committed to consider how it may include more specific and measurable detail in the final draft of the Climate Change Plan.
46. In the medium to long term the Committee calls on the Scottish Government to address this lack of detail by quickly and effectively consulting with its stakeholders in order to clarify and consolidate its future plans for the sector. In particular, to fulfil the Climate Change Act (Scotland) 2009 requirement and set out plans for climate change mitigation, not just up to 2025 but to 2032.

Knowledge and awareness raising

47. Agriculture policy outcome 1 of the Climate Change Plan is concerned with knowledge and awareness raising. It states that "farmers, crofters, land managers and other primary food producers are aware of the benefits and practicalities of cost-effective climate mitigation measures."³ Policies include information and advice on climate change mitigation, the development of an agri-tech group and the recruitment and training of Climate Change Young Farming Champions.
48. Development milestones also include consulting on how to maximise uptake of carbon audits and exploring how to best engage tenant farmers to participate in low carbon farming. The Scottish Government also proposes a low carbon farming marketing scheme.

Voluntary versus mandatory measures

49. The Committee explored the issue of behaviour change and awareness of climate change issues with witnesses. The Committee heard that while there are many early adopters of climate change mitigation measures there was a need to encourage cultural change and to raise the issue of climate change on farmer's agendas. For example, the Committee received written evidence to say that in a recent survey completed by the Department for Environment, Food and Rural Affairs it was found that 47% of farmers surveyed did not believe any action is necessary on climate change, 18% believed there is not much they can do and 11% believed they have done enough.⁴
50. The Committee further considered the benefits of a voluntary approach to effect behaviour change as opposed to regulation. While recognising a step change will be required in the agricultural sector in order to meet the climate change targets the majority of stakeholders supported a voluntary approach to the proposals and policies outlined in the draft CCP. For example, Andrew Bauer from NFUS said—

- ” There is an overarching approach in the agriculture section, which is about working with people over the next few years to build up the knowledge and capacity to change and only looking at stricter, mandatory measures thereafter. That is the right approach. If we went straight to the mandatory measures, we would get kick back and unintended consequences. I support the approach that tries to bind people to the process through demonstrating its value and only regulating thereafter. ⁵
51. SRUC also stressed that, if regulated, the cumulative effect of the proposed actions on agricultural business could be significant. For example—
- ” ...under the current RPP3 proposals an arable farmer may have to: (a) add legumes into their rotation; (b) add livestock grazing into their rotation; (c) use varieties that have improved nitrogen uptake; (d) plant trees; etc. that cumulatively may have significant business management consequences. ⁶
52. However, the World Wide Fund for Nature (WWF) stated in written evidence that the agriculture section of the CCP is over-reliant on voluntary measures. It argued that evidence to date suggests that this approach has delivered only modest emissions reductions and that if the Scottish Government continues with voluntary measures they must be clear how they will be judged and what would trigger wider measures.
53. The Cabinet Secretary made clear to the Committee that he was convinced that a voluntary approach was the best way to achieve Scotland's climate change objectives. He also noted that the agricultural sector was distinctive in the time required for changes to be implemented. He noted that breeding cycles and crop rotations would influence how and when changes would be able to be made.
54. The Committee believes that encouraging behaviour change and a move to greater climate change mitigation measures will require a transformation in Scotland's agriculture sector. While recognising the strongly expressed view of the farming sector that voluntary measures are preferable, the Committee believes that it is reasonable and sensible for the Scottish Government to be ready to consider alternative approaches should the voluntary approach prove to be insufficient.

Advisory services

55. The increase in support and availability of research and advice services in order to increase awareness, technical knowledge and effect behaviour change was welcomed across the board. The Soil Association noted that climate change mitigation practices should be integral to all knowledge transfer and advisory services, with messaging on mitigation measures included as a requirement for all education courses and learning programmes.
56. In addition to increased investment witnesses were clear that strong leadership is required from the Scottish Parliament and Scottish Government as well as rural colleges and farmers across Scotland if we are to meet our climate change goals.

57. While the NFUS was supportive of advisory services it also noted that the average agricultural unit in Scotland only contains 1.2 full-time equivalent staff. This can create challenges and a lack of opportunities for learning. Andrew Bower said—

” That is a tiny workforce that has to deal with a wide and, in some cases, deep body of regulation and guidance, never mind keeping the farm business going. A key barrier is people not having the head space—the time—to reflect on the changes that they will make in their businesses.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Andrew Bauer, contrib. 171⁵

58. The Cabinet Secretary recognised the point about the small average size of Scotland's agricultural units and noted that the average age of Scotland's farmers is 58. He suggested that these points may make behaviour change challenging.

59. The Committee welcomes increased support for advisory services. However, it recognises the challenges that many farmers can face in creating the time to consider climate change mitigation methods. It calls on the Scottish Government to share more detailed plans on how it will support the multitude of small agricultural units across Scotland to help them contribute to the plan.

60. It also calls on the Scottish Government to provide clarity on the ways in which it intends to show and enable leadership in the sector. In particular, detail on how it will raise awareness and disseminate best practice arising from the monitor farms programme.

61. The Committee is aware that increasing knowledge and understanding through advisory services is a powerful tool to enable change. However, many climate change mitigation measures may require an upfront investment. As such, it calls on the Scottish Government to consider how existing financial support or incentives may be best used in order to support the knowledge learned through the advisory services being put into practice.

62. The Committee agrees with the Scottish Government's assertion that climate change mitigation measures can make good financial sense for farmers. To help this assertion become reality it recommends that the advisory services offered should also include a business support element.

Agri-tech group

63. Generally stakeholders were supportive of the proposal in the draft CCP for development of an agri-tech group. However, several noted points that they felt were important considerations for the success of the proposed group which have been outlined in the Committee's recommendation below.

64. The Committee agrees with views of some of its stakeholders that it is essential that the proposed agri-tech group should contain an appropriate mix of science and industry representation and that full use should be made of existing centres of expertise and knowledge exchange. It also calls on the Scottish Government to

be aware of the possibility of stakeholder fatigue and any new group should complement, rather than duplicate, the UK agri-tech strategy.

Carbon audits

65. The draft CCP states that in 2017, the Scottish Government will consult on how best to ensure maximum take up of carbon audits.
66. Quality Meat Scotland (QMS) suggested in written evidence that the proposed target of 1200 free carbon audits lacked ambition and witnesses suggested that the uptake of carbon audits to date has been relatively weak due to farmers' time constraints. The WWF called for the inclusion of a clear mechanism for carbon audit roll out up to 2032 including a regulatory backstop indicating the level of voluntary uptake expected before a measure is made compulsory.
67. Professor Pete Smith from Aberdeen University advocated a more participatory approach to carbon audits. He suggested that group based peer learning activity could help improve education and provide baseline data.
68. The Committee urges the Scottish Government to be more ambitious regarding targets for carbon audit uptake. Following the consultation on how to maximise uptake it calls on the Scottish Government to work with the sector to produce more stretching targets and make public the detail on how it plans to implement its carbon audit roll out up to 2032.

Tenant farmers

69. The draft CCP identified tenant farmers as a group to which it would provide targeted support in order to increase understanding of the environmental and economic benefits of low carbon farming.
70. Alastair Nairn from the Scottish Tenant Farmers' Association (STFA) noted that the tenanted sector is moving from long term to short term tenancies and that this can have an impact on a tenant farmer's willingness and ability to invest the time and resources into climate change mitigation activity. He said—

” If someone has a 10-year lease, they will probably put on their soil the nutrients that they need to get them to year 8. After that, they will not put lime, Scotphos and such things on their land for somebody else to get the benefit, so the production capability of that land then falls away. It is probably the same with short-term tenancies.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Alastair Nairn, contrib. 2017⁷

71. The Cabinet Secretary agreed that tenant farmers may be disinclined to make capital investments in their farms as they will not receive all of the benefits of that investment. He said—

- ” ...tenant farmers, who do not necessarily get all the benefit of investment that they make into their farms, will be less inclined to make a capital investment of any sort, because the return may be shared between them and their landlord.

72. The Committee acknowledges the particular challenges that the tenant farming sector can face when trying to encourage climate change mitigation measures. It calls on the Scottish Government to consider what can be done to address the long term issue of soil fertility while tenant farmers are functioning within short term tenancies. In particular, to consider reviewing the procedure for both initial 'ingo' valuations and end of tenancy 'waygo' valuations so that investment in soil quality can be properly accounted for and compensated.

Low Carbon Marketing scheme

73. The draft CCP proposes to investigate the possibility of a marketing scheme to make low carbon an attractive quality for consumers. SRUC called for a greater evidence base to be accumulated in order to ensure that such a scheme will have the intended effect. This call was echoed by QMS who called for a full economic impact assessment of how it would work with the PGI (Protected Geographical Indication) brands already held within Scotland.
74. Nourish Scotland felt that the scheme was unhelpful and unnecessary as there is already an established organic brand at European and global level which would address many of the challenges outlined across in the plan. Whereas a scheme which focuses solely on greenhouse gas emissions could, depending on how the analysis is done, favour the most intensive and confined livestock systems.

75. The Committee encourages the Scottish Government to take the initial views of stakeholders into account regarding the utility and effectiveness of a low carbon marketing scheme when there are already existing schemes which may provide similar results.

Nitrogen use and soil fertility

76. Agriculture policy outcome 2 in the Climate Change Plan is concerned with nitrogen-use and soil fertility. It states that "emissions from nitrogen fertiliser will have fallen through a combination of improved understanding, reduced application and better soil."³ Policies include precision farming and nitrogen-use efficiency, creating a science-based target for reducing emissions from nitrogen fertiliser and PH soil testing from 2018. Proposals in the CCP include having leguminous crops in rotation and using plant varieties with improved nitrogen-use efficiency.

Nitrogen use - precision and efficiency

77. The Committee heard that emissions from the production and application of bagged nitrogen accounts for around a quarter of agricultural emissions, or around 5% of Scotland's total greenhouse gas emissions.
78. Witnesses were generally supportive of precision farming on soils and nitrogen-use efficiency. However, SRUC cautioned that more research is required to fully evaluate the mitigation potential of the various techniques. It recommended the early establishment of an operational group bringing together academic expertise, government and industry representatives to agree cost-effective measures for improving nitrogen-use efficiency over the next 15 years.
79. The Committee echoes the recommendation of Scotland's Rural College and calls on the Scottish Government to consider the creation of an operational group to agree cost-effective measures to improve nitrogen-use efficiency.

Science based targets for nitrogen

80. The majority of stakeholders welcomed the creation of science-based targets for nitrogen. Many would encourage the Scottish Government to go further and to develop a nitrogen budget for Scotland. A nitrogen budget shows how nitrogen flows through the food and farming systems and can highlight opportunities for reductions and improvements.
81. The Soil Association believes the information provided by a nitrogen budget could be used to inform and strengthen advice, research, and policy, and so improve the financial and environmental efficiency of Scottish farmers. However, it cautioned that production systems and local climate must be considered before policies are made based on a nitrogen budget's results.
82. SRUC stated that nitrogen-use efficiency benchmarking for different soil types, based on use-intensity (i.e. per unit of output), would provide farmers meaningful targets. With this in mind, it recommended that the Scottish Government should ensure that any reduction targets are SMART (Specific, Measurable, Achievable, Realistic and Time-based) for different soil types. It noted that a key aspect of this would be to generate greater uptake and use of nutrient planning and balancing. It also argued that improved knowledge exchange and awareness of best practice would aid voluntary take up.
83. In relation to developing a science-based target for reducing emissions from nitrogen fertiliser the NFUS reiterated the point that this activity would be better done at individual farm level, with businesses being encouraged to make informed decisions, rather than following top-down recommendations.
84. More broadly it was noted by SRUC that this policy has the potential to deliver important outcomes beyond greenhouse gas mitigation (e.g. water and air quality, biodiversity and soil quality). It argued that it is important to ensure links to those wider policy objectives are made, and efforts are made to quantify the impact of actions to mitigate greenhouse gas emissions on other policy areas.

85. The Committee would encourage the Scottish Government to be more ambitious and to create a Nitrogen Budget for Scotland. The Committee notes that Scotland hosts one of the leading global nitrogen research teams at the Centre for Ecology and Hydrology and that we have the expertise and knowledge to aid in this approach.
86. The Committee would urge the Scottish Government to make any science-based targets for nitrogen reduction SMART (Specific, Measurable, Achievable, Realistic and Time-based), taking account of soil type and 'use intensity' as well as local systems and climate.

Soil testing

87. The draft CCP states that from 2018 the Scottish Government will expect farmers to PH test the soil in all improved land every 5/6 years. It will also consult on including testing for potassium and phosphorus.

The STFA was a strong advocate of the importance of soil fertility. Alastair Nairn said—

- ” We should be looking at the fertility of the soils; the decrease in topsoil has had a huge negative impact beyond global heating. Recent research has revealed that if we maintain our current loss of 3 tonnes to 5 tonnes of topsoil an acre annually, we have just 60 years until it reaches zero. That is not a very long time.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Alastair Nairn, contrib. 197⁸

88. The Committee heard that many farmers could use nitrogen much more efficiently, resulting in financial benefits for their businesses as well as environmental benefits. It was advised that having the correct pH level in the soil makes nitrogen more available to the crop, encourages clover growth and reduces the negative effects of aluminium in the soil.

89. Compulsory versus voluntary measures

The Committee on Climate Change recommended a mandatory approach to soil testing and there were clear calls from witnesses such as the RSPB, Nourish Scotland, WWF, Stop Climate Chaos and the Scottish Wildlife Trust to make soil testing compulsory alongside a clear timetable for roll out. In particular, the Soil Association stated that soil testing should be made a compulsory requirement for all Region 1 land within a period of six years for the receipt of agricultural support. It said—

- ” Soil, and its organic matter, are fundamental resources for Scotland and must be safeguarded. Analysing soil is an essential first step toward effective decision-making at local and national levels.

Source: Soil Association Scotland, 2017⁹

90. While organisations such as the NFUS, SRUC and STFA agreed with the principle of encouraging farmers to test their soils it was argued that robust data on current

uptake and effectiveness in emission reduction would be helpful and that roll out should avoid compulsion and bureaucracy wherever possible.

91. The Environment, Climate Change and Land Reform (ECCLR) Committee has also undertaken scrutiny on the topic of soil testing. It received correspondence from the Cabinet Secretary on 20 February 2017 confirming that soil testing would be a voluntary activity, despite previous indications to the contrary both in the Parliament and in the draft CCP before the erratum was issued. This created concerns for the ECCLR Committee regarding the change of policy half-way through the scrutiny process, the contradictory nature of the information that was provided by the Scottish Government as well as the lack of time available to discuss this policy change with stakeholders.
92. The Cabinet Secretary said that he was absolutely convinced that a voluntary approach was the best way to achieve Scotland's climate change objectives and did not agree with making soil testing compulsory. He cautioned that a compulsory approach could have the opposite effect to that intended. He felt that a peer learning approach would be the most effective for example, using demonstration farms.
93. Gordon Struth from the Scottish Government noted that soil testing itself will not impact on climate change. It is what the farmer does following the test which can potentially reduce emissions. However, he cautioned that it would be impossible to compel farmers to perform the test accurately or to take any particular action with the results.
94. The Committee explored whether there should be trigger points for action built in before the Scottish Government's target of all improved land being tested by 2023 is reached. The Cabinet Secretary said that he did not believe that trigger points were a good idea as it would be contradictory to the voluntary approach.

95. The Rural Economy and Connectivity Committee acknowledges the work of the Environment, Climate Change and Land Reform Committee on the subject of soil testing.
96. The Committee would echo the conclusions made above regarding voluntary approaches to behaviour change. While it respects the view that voluntary measures are preferable it believes that it is reasonable and sensible to have alternative projects and plans prepared if progress on soil testing is not made. The Scottish Government should monitor progress, and if the current policy is not effective, it should be prepared to consider further action to ensure farmers are willing and able to soil test effectively and take appropriate action based on the results.

97. **Best practice in soil testing**

SRUC commented that best practice in soil testing should include an assessment of organic matter as well as phosphorus and potassium. This was echoed by the Scottish Wildlife trust who said—

” ...it is unclear to us why soil organic matter is not part of the test – we wonder if this would be useful to map the carbon storage in improved agricultural landscapes as well as helping farmers to manage soil health and biota effectively.

98. SRUC cautioned that whilst such soil sampling could potentially reduce nitrous oxide emissions (and increase yields / lower emissions intensities) further research is required to establish the potential scale of emissions reductions and the nutrient requirements for the range of grassland types present in Scottish agriculture.
99. Professor Pete Smith from Aberdeen University noted that efficiencies could be made between this policy outcome and policy outcome five which is concerned with carbon sequestration in soils. He argued that if soil testing routinely measured soil organic matter status and the efforts to increase carbon sequestration it would allow for monitoring and verification to take place. It would also allow farmers to determine the nutrient status at the start of cropping and livestock production season and how much nitrogen, phosphorus and potassium is required.
100. The Committee noted the importance of good soil health and structure for both mitigating climate change and the future of the farming industry more generally. While acknowledging the additional costs of soil tests for organic matter, phosphorus and potassium may entail, the Committee recognises the additional benefits it provides. In particular, the benefits of measuring organic matter. This includes being able to determine the soil's nutrient status at the start of crop production and the requirements for optimum performance. The Committee calls on the Scottish Government to encourage this approach as best practice.

Leguminous crops and improved nitrogen efficiency

101. The draft CCP highlights that legumes in rotation can significantly reduce the need for nitrogen fertiliser. However, it acknowledges there can be considerable economic factors to consider. It states that the Scottish Government will explore the issues around including a leguminous crop in rotation, including any support payment that farmers would require for doing so.
102. It was noted that there is a need for further consideration of how best to retain nitrogen following a legume crop and awareness raising of the agronomy skills required to grow legumes successfully. In addition, particular points were raised about the types of legumes that are unsuitable in certain colder geographical areas and can be more challenging to harvest in wet seasons e.g. peas and beans.
103. The James Hutton Institute stated in written evidence ¹⁰ that the main opportunities for increasing nitrogen-use efficiency in the system is to ensure the flush of nitrogen from crops to the soil from dead plant material at harvest is not lost to the wider environment but taken up by other vegetation such as under-sowing, a ‘catch’ crop, field margins or beneficial ‘weeds’.
104. Witnesses also noted that there may be opportunities in future to improve the current Common Agricultural Payment (CAP) system in relation to greening and the

planting of legume crops. The existing Ecological Focus Area (EFA) Greening rules for Pillar I of the CAP encourage farmers to sow legume crops. However, organisations such as SRUC and NFUS argued in written evidence that the EFA rules could be improved to encourage greater uptake in rotations by relaxing the requirement to plant two different legume crops in Scotland and removing the August harvest date. Steven Thomson from SRUC said—

” We need to look more holistically at what we do with agricultural policy, because it is the agricultural policy rather than anything else that is driving all the changes.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Steven Thomson, contrib. 238¹¹

105. In regard to planting crop varieties with improved nitrogen-use efficiency, it was suggested that this approach would be important for longer term mitigation. However, there would be a need for cost-effective varieties that do not compromise market potential.

106. The Committee calls on the Scottish Government to conduct further investigation into the nitrogen fixing potential of legume crops and to consider how it might maximise opportunities provided by the UK's exit from the European Union to relax and improve current CAP policies in this area.

Red meat and dairy

107. Agriculture policy outcome 3 of the Draft Climate Change Plan states that the Scottish Government will "Work with Quality Meat Scotland and others to reduce emissions from red meat and dairy through improved emissions intensity." ³ Policy measures include publishing emissions intensity figures for beef, lamb and milk in 2017 and encouraging improved emissions intensity through genotyping, improving fertility, reducing animal mortality and improving farm management practices. Policy development milestones include establishing targets for reduction in emissions intensity and consulting on future livestock health measures. The Scottish Government also proposes to consider livestock feed additives to reduce methane.

Emission intensity

108. In relation to publishing emissions intensity figures it was cautioned by SRUC that using the published figures or benchmarking as a marketing tool for a particular commodity, system or location could prove counter-productive. This is because the lowest greenhouse gas system is not always the one that provides the greatest overall benefit once all factors (e.g. water quality, animal welfare, biodiversity etc.) are accounted for. It was also noted that care must be taken in comparing different systems, particularly lowland and upland systems, as farming opportunities are more constrained in upland areas.
109. SRUC was supportive of the adoption of best practice and uptake of benchmarking to act as a stimulus for farmers outwith the top quartile. It noted that the current Beef Efficiency Scheme (BES) aims to achieve similar goals. However, it has

proven challenging for some farmers to implement in practice. It suggests that a modified BES and a similar scheme for sheep, with easy recording, could improve uptake to help attain this objective.

110. Witnesses, in particular QMS, welcomed the recognition given in the Climate Change Plan to emissions intensity and a drive to reduce these through improved technical efficiency. The emphasis placed on working with Quality Meat Scotland in this section of the plan was noted by witnesses. It was suggested that it would be helpful to expand this approach to cover a wider range of institutes and delivery mechanisms as, in particular, QMS does not cover the dairy sector.
111. Scottish Government official Gordon Struth noted that there was a lot that could be learned from the dairy sector. He noted that two of the climate change focus farms are dairies and that the dairy sector has already been delivering year-on-year efficiency improvements. In terms of the support offered to the sector he stated that many of the Scottish Government proposals are of benefit to dairy farmers, such as soil policies, getting the most from grass, livestock health, and slurry and manure management.
112. The Committee believes that publication of emission intensity figures for red meat and dairy can be a useful benchmarking tool. However, it seeks assurance from the Scottish Government that this will not impose a significant bureaucratic burden on farmers.

Livestock health and feed additives

113. Witnesses were generally positive about the possibility of reducing greenhouse gases in a cost-effective manner through improved livestock health and diet. In written evidence to the Committee the Scottish Government advised that disease can increase the amount of days it takes for an animal to reach slaughter weight, therefore increasing the emissions they produce. Furthermore, infertility and mortality can lead to fewer cows being in calf and fewer calves making it to adulthood. This then leads to the emissions that have been generated not resulting in an end product, for example, a kilo of beef.
114. It is anticipated that schemes such as the Bull Crofting Scheme and the Beef Efficiency Scheme may help to tackle this issues. However, Moredun Research Institute noted that further scientific evidence for the role of animal health in greenhouse gas emissions from livestock, a better understanding of the economics of disease and the cost-effectiveness of interventions is required as well as effective knowledge exchange to encourage uptake of appropriate measures in practice.
115. The Committee encourages the Scottish Government's consultation on the contribution of livestock health to climate change mitigation to include a cost benefit analysis of any interventions, the economic implications of various disease management approaches as well as the most effective methods of knowledge exchange.

Manure and Slurry

116. Agriculture policy outcome 4 of the Draft Climate Change Plan regards the use of manure and slurry. It states that "emissions from the use and storage of manure and slurry will have been reduced"³. Policy development milestones include determining the potential feasibility of self-financing large-scale anaerobic digesters and engaging with farmers to explore their support requirements. Proposals include livestock grazing in rotation on current arable land, conducting a feasibility study for the establishment of manure/slurry exchange and determining how to consistently minimise emissions from slurry storage.

Anaerobic digestion

117. The draft CCP stated that the Scottish Government will work to determine the potential feasibility of self-financing large-scale anaerobic digesters (AD). Some witnesses voiced caution over their use. The STFA noted—

” The profusion of AD plants raises a number of questions. Is there a clear economic and environmental rationale for supporting AD plants? Can the life cycle of emissions of energy crops justify the removal of arable land from food production? Can the growth of non-food crops be morally justified in an age of volatile food security? These questions should be answered before any more land is removed from the food chain.

Source: STFA, 2017¹²

118. The impact of anaerobic digesters in relation to the use of distillery by-products as animal feed was also discussed. The Committee heard that these by-products have traditionally been a cost-effective source of protein which reduces dependency on silage and fertiliser use. However, some distilleries now find it more lucrative to sell this by-product as fuel for AD plants. This has also had an unintended consequence in a rise of transport costs as alternative sources of protein have to be brought in for feed.

119. The Committee highlights to the Scottish Government the concerns of stakeholders in regard to the unintended consequences of the use of anaerobic digesters. This includes removing fields from food production, increased requirements to transport feed and timber and the increased pressure it may place on the livestock industry in less favoured areas.

Improving use and storage

120. The Committee heard that proper application methods and the right type of machinery is vital in terms of mitigating carbon emissions from the use of manure and slurry. For example, the Soil Association advocated incentives for the use of modern spreading machinery with low greenhouse gas emission application methods through a zero interest loan scheme. It also suggested that capital funding should be made available to enable farmers to purchase adequate covered storage for livestock manure as the timing of application is vital to reducing emissions.

121. The Committee recognises that farmers can face upfront costs in the move to more environmentally friendly farming practices. The Committee calls on the Scottish Government to consider how it can best use the existing financial support available to incentivise investment in appropriate covered storage, application methods and machinery for manure and slurry.

Livestock grazing and minimising emissions

122. The CCP suggested a proposal for the inclusion of livestock grazing in rotation on current arable land. The Committee heard in written evidence from SRUC that this may prove challenging unless the arable farm has the infrastructure to manage and fence livestock as well as appropriate grass management. The Committee also heard that husbandry skills, biosecurity and livestock transportation issues need to be fully considered. In addition, it noted that in many cases it felt that slurry/manure and/or digestate exchange could be considered as a more practical solution to the problem.

123. The Committee calls on the Scottish Government to take into account advice that the use of livestock grazing in rotation may be restricted by the infrastructure available on each individual farm. As such, the Committee considers that this approach should be suggested as best practice only. It also calls on the Scottish Government to consider any relevant husbandry skills, biosecurity, soil type classification and livestock transportation issues that implementation of the scheme may impose.

Carbon sequestration

124. Agriculture policy outcome 5 of the Draft Climate Change Plan deals with carbon sequestration. It states that "the carbon content of soil and agricultural land will have improved through carbon sequestration and expanded woodland/forestry and hedgerows".³ It outlines that the Scottish Government will explore with the farming and forestry sectors how best to increase planting of trees and hedgerows which optimise carbon sequestration. Proposals include payments for carbon sequestration and woodland cover targets for agricultural land.

Planting trees and hedgerows

125. Generally stakeholders are supportive of carbon sequestration through increased tree and hedgerow planting. The Committee heard that agroforestry has the potential to be a win-win for both farmers and the climate. In addition to sequestering carbon and improving soil fertility it notes that it can diversify farm income, shelter livestock, improve biodiversity and amenity value, and protect soils.

126. However, the Committee heard concerns regarding finding suitable land for tree planting which does not conflict with the farming industry. STFA suggested that new planting targets should take account of the recommendations of the Woodland

Expansion Advisory Group and that any land previously purchased which is suitable for agricultural production should be returned to the sector as starter farms for new entrants.

127. It was suggested that an Agroforestry Operational Group could be established to investigate and promote the commercial opportunities and feasibility of establishing agroforestry systems and networks in Scotland.
 128. In regards to finding suitable land for planting, the Cabinet Secretary reiterated his support for increased agroforestry and informed the Committee of the practical targeted work being done with sheep farmers and crofters to enable them to plant more trees on their land.
129. The Committee supports the concept of agroforestry and encourages the Scottish Government to maximise opportunities to raise awareness of its benefits and how it can complement existing farming systems.

Woodland cover targets

130. The CCP set out an ambition that by 2032, Scotland's woodland cover will increase from around 18% to 21% of the Scottish land area. Stakeholder comments on how best to achieve this focused mostly on subsidy and funding. The Committee received written evidence from organisations such as STFA and SRUC that grant rates would need to be increased to encourage any move from livestock or crop production, especially where fencing is required. It was also suggested that incentives should be targeted at existing land-owners/farmers, especially in the upland grazing areas. In addition STFA suggested that proper management of new plantings should be a precondition of grant aid.
 131. The Soil Association Scotland noted that the current Scottish Rural Development Programme funding is only available for relatively small areas within a very narrowly defined type of land. It also highlighted the possibility of a conflict in entitlement should farmers access the Forestry Grant Scheme agroforestry option while also engaging with the Basic Payment Scheme.
132. The Committee acknowledges that there needs to be a range of incentives to encourage farmers to make the cultural and practical shift for agroforestry and meet any woodland cover targets. The Committee calls on the Scottish Government to consider what incentives it can make available which are practical, targeted, simple and effective.

Additional areas for inclusion

133. The Committee asked witnesses whether they had suggestions for areas that they would have liked to see included in the Climate Change Plan. Witnesses made a

number of points regarding organic produce, measures to reduce demand on red meat, conservation tillage and a national health planning service.

Organic produce

134. Nourish Scotland is a strong advocate for organic products and calls for its inclusion in the plan. It stated that research consistently identifies that organic farming uses less energy and delivers lower greenhouse gas emissions per unit of area and in most cases per unit of product. In addition, organic management typically leads to higher soil carbon sequestration.
135. The Committee heard in written evidence that the land area under organic management in Scotland declined from 4% to 2.3% in the five years to 2015, while in the same period the EU average increased. Nourish Scotland called for an ambitious target for organic farming (e.g 5% of land in each of the three CAP 'regions' to be organic or in conversion by 2020).
136. The Soil Association also supported the increased use of organic farming in the plan as it recognised it as a sustainable production system. It stated that it is good for the environment, good for producers, recognised by consumers, and due to rigorous auditing requires no new framework or quality assurance mechanism.
137. The Committee notes the views of stakeholders that organic farming has the potential to be beneficial through increasing biodiversity, protecting air and water, improving soils, and reducing antibiotic usage in livestock systems. It calls on the Scottish Government to outline why, if it has already committed to an Organic Action Plan, it chose not to include mention of organic methods in the Climate Change Plan.
138. The Committee also calls on the Scottish Government to consider organic produce in its development of the upcoming Good Food Nation Bill.

Demand

139. Professor Pete Smith from Aberdeen University argued for measures that would reduce the demand for red meat through dietary change. He noted that agriculture is one of the only sectors where demand side measures to reduce consumption are not encouraged and suggested that, moving towards 2050, even more ambitious targets, perhaps involving such measures, will be required. Whilst acknowledging it is a controversial view, Professor Smith argued that it had a large technical potential for climate change mitigation. He said—

” In the current assessment of what is possible with the climate, it would represent a big mitigation of emissions. We would have to consider all the social justice and policy issues associated with it, but given that Scottish diets are not the most healthy in the world, such a change could co-deliver on both the public health agenda and the climate change agenda.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Professor Smith, contrib. 198¹³

140. The Committee notes that agriculture is one of the only areas in the Climate Change Plan which does not discuss measures to reduce demand. It encourages the Scottish Government to consider demand side measures as it develops the upcoming Good Food Nation Bill and whether positive links can be made between mitigating climate change, food production and healthy eating.

Conservation tillage

141. Conservation tillage is an approach which reduces the loss of carbon to the atmosphere by minimising soil disturbance when planting crops. The STFA states that arable farmers who use conservation tillage practices are typically able to increase the organic matter levels in their top soils by 2 percentage points or more over a 10 year period. It suggests that this could make a huge difference to Scotland's carbon emissions and may even be sufficient to mitigate all of the annual 10MtCO₂e emissions from Scottish agriculture. In addition to reduced labour and resource costs for farmers STFA states that it has considerable benefits for the soil such as increased bio-diversity and capacity for the soil to hold nutrients.
142. While new approaches can mean new challenges such as new pest or weed control measures STFA states that these can be counteracted with shared practice from farmers experienced in conservation tillage.

143. The Committee calls on the Scottish Government to consider the practice of conservation tillage where it is appropriate for inclusion in the final draft of the Climate Change Plan.

Transport

144. Transport accounts for 28% (13 MtCO₂e) of Scotland's total emissions, making improvement in this area particularly important in meeting the Scottish Government's carbon reduction targets. The transport sector covers all transport modes in Scotland, including public transport, freight, aviation, shipping, private motoring, active travel and the regulations, policies and infrastructure designed to support all of these. The draft CCP sets out eight transport policy objectives, 18 policies and nine proposals.
145. The draft CCP predicts a cumulative fall in transport emissions of 31% between 2017 and 2032. However, the Plan also predicts that transport emissions will increase from 28% to 33% of total emissions by 2032 due to increased efficiency being offset by increased demand.
146. The transport policies and proposals are based on an assumption that vehicle traffic will grow by around 27% by 2030. However, this approach to predicting future transport emissions was questioned by witnesses. Professor Tom Rye from Edinburgh Napier University argued that the growth as predicted in the report is too high. He suggested that it may be more effective to determine the level of traffic we want to have and then identify what we need to do to achieve it, rather than base modelling on traffic forecasts that are treated as something that cannot be influenced. He said—
- ” Our modelling tools are not as sophisticated as they could be—perhaps they will never be sufficiently sophisticated. Consequently, I advocate the approach of thinking about scenarios such as where we would like to be and what we need to do to get there.
- Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Professor Rye, contrib. 21¹⁴
147. Some of the evidence received by the Committee was critical of the assumption made for transport in the draft CCP. For example, in written evidence Transform Scotland noted—
- ” It is clear that the outputs from the TIMES model have been reached through flawed and unrealistic assumptions regarding traffic levels. Almost all of the Policies and Proposals for reducing carbon emissions from transport appear to have been based on Transport Scotland's forecast of a 27% increase in private car use by 2035. Given that vehicle use increased by less than 5% between 2004 and 2014, Transport Scotland's forecast is vastly inconsistent with current traffic trends. Due to the inaccuracy of the traffic forecasts, it seems that the outputs from the TIMES model have become nearly all centred around private cars, with almost no attention given to Policies which address the need for a modal shift away from private car use.¹⁵
148. When he was asked to explain how this figure was arrived at and what it represents, the Minister for Transport and the Islands said that 27% is a forecast, not a target. He added—

- ” [the figure] is the expected demand growth if we sit on our hands and do nothing at all. The point is that we have created a plan to try to tackle some of that. The figure should not be seen as a target—far from it; it is simply a forecast that the model uses.

Source: Rural Economy and Connectivity Committee 22 February 2017 [Draft], Humza Yousaf, contrib. 171¹⁶

149. However, the Minister was unable to confirm what a more acceptable target growth would be and stated that this depended on the development of proposals with other bodies, such as local authorities. Scottish Government official Jonathan Dennis said that as the traffic growth is likely to be less than 27% once further policies were developed it was not a forecast—

- ” The prediction that we have here, given what we know about population growth, economic growth, car ownership and so on, is of where we will end up if we do nothing more. It is not a forecast.

Source: Rural Economy and Connectivity Committee 22 February 2017 [Draft], Jonathan Dennis (Scottish Government), contrib. 174¹⁷

150. The Committee heard that stakeholders are unconvinced by the assumption that vehicle traffic will grow by 27% by 2030 and the Minister’s explanation of the figure lacked clarity. The Committee feels that this figure is key to understanding the Scottish Government’s ambitions and urges it to include more information on how the 27% figure was arrived at and how this has impacted the policy and proposal outcomes modelled by TIMES.

Progress to date

151. Between 1990 and 2014 emissions from the transport sector fell by 3% (or 0.8% excluding emissions from aviation and shipping). During this time there was an increase in the energy efficiency of most vehicle types, but this increased efficiency has been offset by increases in demand.
152. According to the Committee on Climate Change, efforts to reduce transport emissions from the 1990 baseline have been insufficient. It urges the Scottish Government to go further to put Scotland clearly on track to achieve its ultimate goal of being free from harmful tailpipe emissions by 2050.
153. Phil Matthews from Transform Scotland was also critical of the progress made to date—

- ” Looking back all the way to 1990, I think that transport is the one major area in which we have seen very little reduction.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Phil Matthews, contrib. 54¹⁸

154. Despite a general underperformance in the transport sector, some witnesses felt that there had been greater success in some areas than in others. The progress

made in ultra-low-emission vehicle sales, albeit from a very low base, was commended on by David Beeton from Urban Foresight. He said—

” In 2015, sales of electric vehicles were equivalent to the previous four years combined and 2016 sales look set to outstrip that...there is also a comprehensive network of charging infrastructure support

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], David Beeton, contrib. 65¹⁹

155. However, during evidence, the Committee heard that less progress had been made in relation to active travel with Scottish transport statistics showing that in 2015, only 1% of journeys were by bike, which is well below the 2020 ambition of 10%. This figure has remained around 1% since 2003.
156. It was widely acknowledged in evidence that there have been considerable improvements in vehicle fuel efficiency since 1990. However, action to reduce travel demand and interventions aimed at encouraging modal shift to active and sustainable modes have been largely absent in all three Climate Change Plans. These are deemed to be the best way to achieve significant long-term reductions in transport emissions. Much of the evidence received by the Committee on the transport element of the draft CCP suggested that greater emphasis should have been placed on demand management and modal shift to walking, cycling and public transport.

Proposals and Policies

157. The Committee considered a range of issues regarding the format and transparency of the proposals and policies within the draft CCP and witnesses expressed concern over the lack of detail in the transport section.
158. For example, in written evidence to the Committee, the Consumer Futures Unit said—

” Unlike previous reports on policies and proposals (RPP1 & RPP2), the draft CCP does not include details of specific emission reductions attributable to each policy or proposal. ²⁰
159. The session 4 Infrastructure and Capital Investment Committee found that with regard to transport emissions, RPP2 contained considerably less detail than RPP1. ²¹ The most recent draft CCP has been criticised for having fewer monitored measures and less transparency than RPP2. Stakeholders told the Committee that they would expect more detail about the implementability of the policies and proposals and links to data sets to be included in appendices, if not the main body of the report.
160. The Committee on Climate Change noted that achievement of targets depends on a mix of EU, UK and Scottish Government measures, such as EU car and van efficiency standards and Scottish measures to promote modal shift and a switch to ultra-low emission vehicles. Local authorities also play a key role in implementing transport measures, including the management and maintenance of local roads,

developing and implementing local transport plans and subsidising socially necessary bus services that cannot be provided on a commercial basis. It is, in part, this collaboration with other bodies and with the private sector, which create uncertainty and a lack of clarity in the proposals.

161. Stakeholders also expressed concern that the policy outcomes, policies and proposals make a number of assumptions, which in turn form the basis of the outlined targets. Phil Matthews of Transform Scotland indicated that he thought the overall target was realistic, but said—

” [it] is very much predicated on a range of unknowns. There are technological unknowns and there is the whole issue of European standards and the fact that a lot of the possible actions are predicated on action that is completely outwith the control of the Scottish Parliament.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Phil Matthews, contrib. 54¹⁸

162. The Committee also considered the appropriateness and effectiveness of the Scottish Government's proposals and policies for the transport sector as a whole. Many witnesses felt that greater detail on behaviour change, modal shift and demand management would have resulted in a far more effective and ambitious plan. Phil Matthews told the Committee—

” you should approach this issue by thinking of a hierarchy of actions. The first action is to reduce the need to travel; the second action is to look for the more sustainable modes of transport; and the last action is to look for more benign technical fixes

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Phil Matthews (Transform Scotland), contrib. 39²²

163. The Climate Change Plan predicts a cumulative fall in transport emissions of 31% between 2017 and 2032. However, the Plan also predicts that transport emissions will increase from 28% to 33% of total emissions by 2032. This suggests that more will need to be done if emission reduction measures are to counteract increases in demand and near-zero emissions are to be achieved by 2050.

164. The Committee notes stakeholders' concerns that since RPP1 each version of the Climate Change Plan has included less detail with regard to transport emissions. The Committee calls on the Scottish Government to reverse this trend and include more information in appendices to provide clarity on what action and financial resources will be required to meet targets within the transport sector. This would make the Scottish Government's ambitions in this area more transparent and easier to monitor.

Technical measures

165. The draft CCP focuses on the ways in which technological developments will reduce transport emissions. This includes incentivising more rapid uptake of electric and ultra-low emission cars and vans, enhancing the capacity of electric vehicle charging networks and electrification of the rail network.

Ultra-low emission and electric vehicles

166. The Scottish Government makes reference to a number of predictions in the draft CCP in relation to cars, which form the basis of its climate change ambitions. These are that—
- there will be fuel efficiency improvements of 30% - 40% by 2035;
 - the battery cost of hybrids and electric vehicles will halve by 2035;
 - the performance of hybrids and electric vehicles will double by 2035; and
 - there will be a step-change in market penetration from 2020 onwards.
167. A number of witnesses raised concerns that the draft CCP is overly reliant on the uptake of ultra-low emission vehicles to achieve transport emission reductions. RSPB suggested that the policies and proposals around electric vehicles should be monitored closely and reviewed regularly to ensure that actual uptake is consistent with projected levels.
168. The Committee on Climate Change noted that there has been good progress in improving new car efficiency in 2014 and 2015 and that this has been driven by the EU directive targeting 95 gCO₂/km by 2020.
169. The plan envisages that 40% of all new cars sold will be ultra-low emissions by 2032 and the Committee notes the valuable contribution that increased sale of ultra-low emission vehicles has made in reducing transport emissions to date. However, the Committee on Climate Change also suggested that Scotland should aim for 65% uptake of such vehicles by 2030.
170. The Scottish Government's target is less ambitious than some stakeholders expected. Friends of the Earth noted that Belgium, the Netherlands, Germany and Norway are all either discussing or are committed to targets of 100% by 2025 or 2030. When asked about the Committee on Climate Change's recommendation of 65%, the Minister confirmed that the Scottish Government's preference is to have a realistic, credible and deliverable pathway, which he felt was represented by the 40% target.
171. Professor Tom Rye questioned the level of funding that would be needed to incentivise uptake of ultra-low emission vehicles to the 40% level indicated in the Plan. He outlined the extensive package of incentives provided in Norway to achieve comparable uptake figures—
- ” I understand that the Norwegian purchase incentive package consists of zero purchase tax, which knocks off about £10,000, plus purchasers do not have to pay VAT on electric vehicles. They also get reduced road tax, get free public parking and do not have to pay tolls...Electric vehicles also get free access to bus lanes. All that reduces the cost premium of an electric vehicle to about €1,000, or £900.
- Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Professor Rye, contrib. 111²³
172. The Committee also questioned whether having an incentive package that is as extensive as the Norway model would increase overall car ownership, contradicting

the Scottish Government's overall ambition to reduce emissions. Professor Rye confirmed that people who bought an electric car in Norway often did so as a second car and tended to move away from using public transport, walking or cycling, suggesting that any incentive package would need to be carefully considered .

173. According to the draft CCP, the battery cost of hybrids and electric vehicles will halve by 2035. David Beeton again commented that the draft CCP relies on assumptions, which in turn create uncertainty in the accuracy and feasibility of the proposals—

” The price of batteries for electric vehicles is decreasing radically and is expected to decrease exponentially during the next few years. We do not really know how quickly that will happen. The Government certainly does not have any direct control over that; it very much depends on industry expertise.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], David Beeton, contrib. 33²⁴

174. Ultra-low emission vehicle targets are based on an expectation that technology will continue to develop and be matched by greater uptake of electric vehicles. However, the cost reductions needed to encourage this uptake will largely be driven by global markets, making it difficult to make accurate estimations. Energy UK also urged that funding for research and development will be required if the uptake of new technological developments is to be as quick as possible.
175. The Minister acknowledged that even without governmental input, technological developments would make more controversial policy interventions unnecessary. However, according to the Minister, meeting the longer-term 2050 target was also dependent on technological change, raising the question why early proposals and policies that would impact demand and behaviour were not given greater consideration.

176. The Committee recommends that further information on any incentives proposed by the Scottish Government and the associated costs required to encourage uptake of ultra-low emission vehicles is detailed in the CCP.

177. Witnesses also acknowledged that if the number of electric vehicles is to grow significantly in the future this needs to be supported by a network of charging points. The Committee heard that good progress had been made in this area since the publication of RPP2. David Beeton suggested that London, north-east England and Northern Ireland were the only places in the United Kingdom with more charging points per household than Scotland.
178. The Minister confirmed that £15 million has been spent on the ChargePlace Scotland network, with a total of 600 charging points and 1,200 charging bays across Scotland. Some members were concerned that funding to enhance the electric vehicle charging network is only committed until August 2019. The Minister suggested that demands on funding would be assessed closer to 2019 to establish if further incentives or infrastructure would be required to encourage uptake.

179. The Committee welcomes the progress made in developing electric vehicle charging infrastructure and encourages the Scottish Government to continue to assess whether further investment is needed to extend the charge place network to support its ambition for 40% of all new cars sold to be ultra-low emissions by 2032.
180. Further assumptions are made about the UK Government's receptiveness to proposals for further reform of the vehicle excise duty (VED) system to favour ultra-low emission vehicles. The draft CCP also commits the Scottish Government to press the UK Government to negotiate stretching emission standards at EU level. Again stakeholders expressed concerns that many of the policies in the plan focus on areas outwith the Scottish Government's direct influence.
181. The Committee asked the Minister what discussion had been had with the UK Department of Transport about changes in VED. In a written response, the Scottish Government assured the Committee that Transport Scotland officials maintain regular contact with the UK Government's Office for Low Emission Vehicles with the most recent discussions taking place on 21 February 2017. This included discussion on the Vehicle Technology and Aviation Bill and a range of ultra-low emission vehicle initiatives. The written response indicated that, moving forward, discussions would focus on maintaining vehicle excise duty differentials between ultra-low emission vehicles and diesel/petrol vehicles to support uptake.

Consolidation centres

182. There is a proposal in the draft CCP which aims to encourage freight operators to develop and utilise consolidation centres, with a view to ensuring HGVs/LGVs run at high capacity and loads are switched to smaller ultra-low emission vehicles for use in urban areas. The aim being to reduce the number of heavy goods vehicles operating in urban areas, reducing greenhouse gas emissions, reducing local air pollution, helping to reduce congestion and improve road safety.
183. Dr Jason Monios from Edinburgh Napier University raised serious concerns about the viability of such centres suggesting that overarching Government support and a comprehensive policy would be needed to encourage the logistics industry—
- ” although transport policy and other such documents have been talking about consolidation centres for the past 10 years, we still do not have one in Scotland. To say that private sector operators and users are reluctant to use consolidation centres is a massive understatement. Basically, they have no interest in them at all.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Dr Monios, contrib. 141²⁵

184. In written evidence the Consumer Futures Unit advocated delivery consolidation centres in rural areas, not just urban areas as proposed in the plan. Dr Monios also suggested that the pedestrianisation of city centres can become a supportive freight transport policy - an approach that Sally Hinchcliffe, representing Pedal on Parliament, also advocated to encourage active travel.

185. The Committee calls on the Scottish Government to provide plans on how it intends to challenge the retail, freight and logistics industries' reluctance to establish consolidation centres in urban and rural areas to help reduce emissions and congestion.

Modal shift

186. The largest contributor to transport emissions is the road sector. In combination cars, lorries, vans, buses and motor cycles accounted for 73% of total transport emissions in 2014. In this context, the Committee heard that in order to make considerable reductions to total transport emissions there needs to be a significant shift away from car use towards other, less carbon intensive, forms of transport.

Active Travel

187. The Scottish Government's target is for 10% of everyday trips to be taken by bike by 2020. This ambition is outlined in the Cycling Action Plan for Scotland and is restated in policy outcome 8 of the draft CCP. However, the number of journeys taken by bike has remained at around 1% since 2003 with little sign of progress towards the 10% ambition.
188. In its report on the Draft Budget 2017-18, the Committee noted that the active travel budget as a proportion of total transport spending has fallen from roughly 1.7% of transport expenditure in 2016/17 to 1.6% in 2017/18 – a decrease of around 6%. Stakeholders also highlighted that, given current levels of investment, the Scottish Government is unlikely to meet its walking and cycling targets. These concerns were echoed in the written submissions received by the Committee in relation to the draft CCP, where some evidence suggested that 10% of the total transport budget should be spent on active travel.
189. Witnesses raised concerns about the CCP's apparent lack of focus on the potential contribution modal shift from driving to walking and cycling could make to emissions reduction. Cycling Scotland stated in written evidence that—
- ” Cycling is a viable and cost-effective way to reduce carbon emissions, as a zero carbon option, to help move Scotland towards a carbon-neutral economy, and we would like to see greater emphasis of this in the draft Plan. Encouraging more Scots to use a bike instead of a car for short trips can significantly reduce the huge contribution road transport makes to CO2 emissions. 65.4% of car journeys are less than 5km, offering the greatest possibility to switch to cycling.
190. The Committee heard that in addition to walking and cycling, electric bikes should also be encouraged as an alternative mode of transport. Sally Hinchcliffe stated—

” ...the one electric vehicle that will not be subsidised is the electric bike, which now forms something like a third of the market in the Netherlands and Germany and is starting to transform the 5 to 10-mile journey as well as the 0 to 5-mile journey. We talk about the bike as though it can do only short journeys, but it becomes much more capable with pedelec.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Sally Hinchcliffe, contrib. 115²⁶

191. While acknowledging the indisputable health benefits of increased active travel, the Minister maintained that it was right for journey by bike and foot to receive less attention in the Plan than other carbon-cutting methods. He commented that this was not meant to undermine the importance of walking and cycling, but to channel the focus on carbon abatement. The Minister felt that active travel could only make a small contribution to the Scottish Government's overall climate change ambitions. An alternative view was taken by others who provided evidence to the Committee. For example, Pedal on Parliament stated in written evidence that their own calculation would suggest that—

” ...achieving the CAPS target of 10% of journeys by bike would save up to 0.2 MtCO₂e per year, or around 5% of the envisaged reduction in emissions from the transport sector.²⁷

192. The Committee considers that active travel has an important contribution to make in reducing carbon emissions, particularly where it replaces car use. It therefore calls on the Scottish Government to set out how it intends to meet its walking and cycling modal shift commitments, especially 10% of everyday trips by bike by 2020, in the final CCP.

Public Transport

193. Transport policy outcome 4 outlines the Scottish Government intention that 50% of the Scottish bus fleet will be low emission by 2032. Policy measures include providing financial support to purchase and operate low carbon buses, to conduct a review as part of the National Transport Strategy and to look at the possibility of introducing low emission zones.
194. The Committee notes that diesel buses are a minor source of greenhouse gas emissions, but can be a contributor to local air pollution and welcomes this move to reducing emissions. In discussion, some members of the Committee felt that aiming to have electric buses rather than a low emission fleet would be more ambitious. The Minister did not discount this as a possibility, but explained that as a degree of stakeholder engagement with bus operators was undertaken as part of the Element Energy modelling, further consultation would be needed to confirm whether bus operators were comfortable with the accelerated rate of change.
195. When asked about the success of the hydrogen bus project in Aberdeen, David Beeton explained that the scheme was going well, but that a mix of solutions would

be needed to bring about a low-carbon future in transport. He felt that without subsidy, hydrogen was too expensive to be a solution in the short-term.

196. The Committee calls on the Scottish Government, in considering options for making 50% of the Scottish bus fleet low-emission by 2032 to explore all alternatives to diesel, including electric, hydrogen and hybrid options.

197. In relation to buses, the draft CCP again focusses on low carbon technology rather than increasing bus patronage. When witnesses were asked if the draft CCP was missing any key policies, Sally Hinchcliffe, representing Pedal on Parliament, commented that mode shift away from the private car to include public transport is a strong part of climate conversations, but does not feature in the Plan. Phil Matthews of Transform Scotland stated that bus patronage has fallen by about 10% in the past 5 years and felt that the Scottish Government and Local Authorities could do a lot more to boost bus travel and integrate it with other sustainable modes.

198. Transform Scotland also noted that the Scottish Government's focus on private cars contradicts its aim to promote sustainable economic growth as Scotland has two large bus operating companies and a world leader in bus manufacture. Despite this, the draft CCP does not mention supporting bus companies and bus manufacturers to a level necessary to reverse the decline in bus patronage.

199. When asked why increasing bus patronage does not feature in the plan, the Minister made a commitment to look more closely at modal shift—

” I will reflect on the wording, as you suggested. My ambition is to put in place what is needed if there is to be a reversal in the decline in bus patronage. Such a reversal will not happen overnight or in 12 months, but it is something that we should be aiming for in the long term.

Source: Rural Economy and Connectivity Committee 22 February 2017 [Draft], Humza Yousaf, contrib. 221²⁸

200. The Committee notes that the Minister's ambition to increase bus patronage does not seem to be matched by action. On 22 February, the Committee considered the National Bus Travel Concession Scheme for Older and Disabled Persons (Scotland) Amendment Order 2017 [draft]. At this meeting some Committee members felt that the new cap on financial reimbursement to bus operators for the scheme was not reflective of the Government's aim to reverse the decline in bus travel.

201. In its written submission, Cycling Scotland also highlighted the need for integrated journeys and smart ticketing solutions. The Committee heard that there was potential for short journeys by bike to be connected with buses, trains and trams. Phil Matthews added—

” We need to create a system of seamless interchange and part of that is about information provision—such as letting people know through their phones when a bus is coming

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Phil Matthews, contrib. 103²⁹

202. Having considered evidence on this matter, the Committee would like to see policy outcome four complemented by a strategy to increase the number of people using buses as an alternative to car use and reverse the current decline. The Committee recommends that policies to encourage modal shift and incentivise bus patronage are outlined in the CCP. This could include support for the development of bus priority measures by local authorities. It also recommends further and increased support for the development of walking and cycling infrastructure to allow for integrated active travel and public transport journeys, with a view to encouraging modal shift from private cars.

203. The Committee is concerned that possible future changes to eligibility for the National Bus Travel Concession Scheme for Older and Disabled Persons has potential to impact on passenger numbers and travel choices. The Committee urges the Scottish Government to ensure that, as part of its proposed consultation on changes to the Concessionary Travel Scheme, it seeks to identify any unintended consequences these may have on its climate change ambitions.

Freight

204. Transport policy outcome 3 of the Draft Climate Change Plan is concerned with road freight. It states that "average emissions per tonne kilometre of road freight [is] to fall by 28% by 2032".³ Modal shift from road to rail was regarded by witnesses as a positive change to the freight industry. However, Dr Jason Monios acknowledged that rail freight services relied on continued public subsidies to reduce the unit cost and make them competitive with road transport. Dr Monios noted that current infrastructure constraints make it difficult to reduce unit cost by lengthening trains.

205. When asked for one key freight related policy for inclusion in the draft CCP, Dr Monios stated—

” It is difficult to point to one thing, especially with freight, as that is much more driven by the private sector. The Government has perhaps even less influence and control over freight than it has over passenger transport. Longer trains are in there; the issue is how much we want to spend on them. That is the key policy.

Source: Rural Economy and Connectivity Committee 08 February 2017 [Draft], Dr Monios, contrib. 188³⁰

206. The Committee recommends that the Scottish Government continues to invest in a range of infrastructure enhancements to support the Rail Freight Strategy and support the extension of train length.

Demand measures

207. The Committee recognises that for the Scottish Government to reach its target of near-zero emissions from the transport sector by 2050, a variety of measures will need to be adopted. Whilst technological developments have brought welcome emission reductions in the past, witnesses spoke of the need for greater emphasis on traffic management, as efficiency gains have been cancelled out by increased demand to date.
208. Professor Rye noted that the demand for car travel is driven by cost and journey speed. Therefore, if demand for car travel is to reduce, a package of incentives and disincentives must be put in place to diminish the appeal of car travel and heighten the appeal of alternative options. He cited an example where substantial investment in the Madrid metro and suburban railway was not mirrored by modal shift as no road traffic demand management measures were implemented alongside that investment.
209. Friends of the Earth Scotland stated in written evidence that—
- ” No proper research seems to have been commissioned by Transport Scotland into demand management, active travel or modal shift. Work commissioned for RPP1 showed that some demand management options, including workplace parking levies, speed limit reductions and increased public parking charges are, for instance, four or five times more cost-effective at reducing carbon emissions than investment in electric vehicles, yet no demand measures are given any serious consideration in the Climate Change Plan.³¹
210. The Committee on Climate Change noted that as part of the devolution settlement, the Scottish Government has additional power to set speed limits, which could reduce fuel consumption. The Minister confirmed that the Scottish Government is not considering parking charges as a demand management measure, but considers that low emission zones will contribute to constraining demand.
211. Carplus Bikeplus suggested in written evidence that car clubs and bike share schemes could also be influential demand management measures. They felt that these should be built into the Climate Change Plan, with a focus on establishing car clubs in urban areas with a population of over 20,000.

Infrastructure investment

212. The Infrastructure Investment Plan 2015 listed the budget for investment in road infrastructure as £9.17bn, yet the budgets for low emission vehicles, active travel and maintaining accessibility for all are still to be confirmed. Investment in infrastructure was a recurring theme throughout the Committee's evidence gathering with many witnesses commenting that capital investment did not appear to support the Scottish Government's emission reduction ambition.
213. The "Carbon Account for Transport" looks at transport projects that are currently under construction or in planning, and assesses their carbon impact.³² As Professor Rye noted in evidence to the committee, all Transport Scotland backed major transport infrastructure projects have a net negative effect on emissions, except for the Edinburgh-Glasgow Improvement Programme (EGIP).

214. The Minister accepted that there is a number of competing priorities and carbon abatement had to be balanced with economic growth. However, Carplus Bikeplus suggested that carbon abatement and economic growth could co-exist. It said—

” Supporting inclusive economic growth should be achieved by improvements to bus and rail services, and creating attractive towns and cities which will benefit citizens of all ages and abilities, not just those who can drive. ³³

215. The Committee recommends that when the Scottish Government is planning major infrastructure projects, a key consideration should be how these might impact on its climate change ambitions .

Low emission zones and Workplace Parking Levies

216. The Scottish Government states that as a policy development milestone it will collaborate with local authorities to reduce congestion through the introduction of low emission zones and intends to put in place a pilot by 2018. The Minister confirmed that the introduction of a low emission zone pilot was a manifesto commitment and has received cross-party support.

217. The Committee acknowledges that low emission zones would be administered by local authorities and that the Scottish Government cannot therefore include them as a definitive policy. However, the Committee is supportive of low emission zones and would welcome further detail when it engages with the Scottish Government on its refresh of the National Transport Strategy later in 2017.

218. In written evidence, several stakeholders also welcomed the mention of workplace parking levies in the draft CCP. However, Friends of the Earth expressed disappointment that the levies are not included as a proposal, particularly as they cannot be introduced without primary legislation. There was no commitment to legislate in the Plan and witnesses commented that low emission zones and workplace parking levies appeared to be a token suggestion at demand management rather than a meaningful policy proposal.

219. The Committee is of the view that demand management measures such as low emission zones and workplace parking levies have potential to make a significant emissions reduction contribution. It therefore calls on the Scottish Government to consider whether these measures should be afforded increased prominence in the final CCP.

Aviation

220. In 2014, aviation emissions stood at 15% of total transport emissions. As part of the devolution settlement, the Scottish Government has additional powers to control air passenger duty and has suggested that the duty might be cut by 50%. This would

aim to increase flight and passenger numbers, which in turn would lead to increased carbon emissions.

221. At its meeting on 8 February 2017, the Committee heard that some witnesses were concerned that cutting air passenger duty would have a detrimental effect on carbon emissions and the demand for rail. Transform Scotland considers air travel to be under-taxed compared with other transport modes and suggested that reducing tax would take business away from rail companies on long-distance routes. Carplus Bikeplus suggested that behaviour change is significant in swapping domestic flights for rail. The Minister for Transport and the Islands noted that increased emissions was a possibility, but felt that this was manageable and that the economic benefits outweighed any potentially detrimental effect on carbon levels.

222. The Committee recommends that the potentially negative impact on carbon levels as a result of the proposed reduction in air passenger duty should be clearly covered in the CCP. It also recommends that the Scottish Government should commit to undertaking and publishing an analysis of the likely increase in carbon emissions from aviation if air passenger duty were to be reduced.

Additional areas for inclusion

223. Witnesses were asked if there were any additional areas, which they would have liked to have seen in the plan. Land use was identified as an area entirely omitted from the CCP.

Land use and planning

224. Although not directly a transport matter, several witnesses raised concerns about the draft CCP's lack of focus on land-use and its impact on trip length and modal choice. Professor Tom Rye explained that patterns of land-use directly impact transport emissions. People are generally living further away from people that they know and where they work, which influences journey length and modal choice. Professor Rye expressed disappointment that this was not incorporated in the draft CCP.
225. The Royal Town Planning Institute (RTPI) also stated in written evidence that walking, cycling and use of public transport can be made easier while private car journeys can be discouraged through planning. Good planning informs the density of development, its location, and how it is integrated into other land-uses such as employment areas and schools. The RTPI further commented that there is a need for new development to be connected to public transport networks, particularly in rural areas.
226. In written evidence from private individual Edward Hawkins he commented that poor planning decisions, like out of town shopping centres have locked-in unsustainable choices for decades. He suggested that any future expansion of these shopping and business centres should be supported by plans to reduce parking spaces and provide public transport alternatives or safe cycle routes.

227. The Committee urges the Scottish Government to develop the very limited section on land-use and planning in the CCP. It calls on the Scottish Government to integrate a climate change impact assessment into planning decisions, weighing economic benefit with the overall ambition of reducing carbon emissions.

Forestry

Progress to date

228. Forestry in Scotland acts as a carbon sink i.e. more emissions are taken up by forestry than are released. Between 1990 and 2014 the size of the sink has increased by 16%. However, in its fifth progress report the Committee on Climate Change noted that—

” The rate of increase has been slowing since 2004, reflecting low tree planting rates historically - current net carbon sequestration rates are currently reducing year-on-year due to the lower proportion of young trees in Scottish forests.

Source: Committee on Climate Change, 2016¹

229. On forestry, the Committee on Climate Change notes that RPP2 included a policy to increase the tree planting rate to 10,000 hectares per year (creating 100,000 hectares by 2022) and that this target has not yet been achieved, with around 8,300 hectares planted in 2014 and 7,600 hectares planted in 2015.

230. The Cabinet Secretary acknowledged the fact that the Scottish Government has failed to meet its forestry targets to date. He outlined the measures the Scottish Government is taking in order to address this. These include an increase in the funding available for forestry grants, streamlining of the approvals process, encouraging suitable applications, implementing a delivery plan and various work streams as well as an increased budget next year for the timber transport fund.

231. The Committee notes that progress since the last Climate Change Plan in 2013 has been slow and that the Scottish Government has failed to meet its forestry targets. However, it acknowledges that plans have been put in place which seek to address this failure and improve planting rates in future.

Proposals and policies

232. Forestry policy outcome 1 of the Draft Climate Change Plan Forestry states that "to enhance the contribution that trees make to reducing emissions through sequestering carbon, we will introduce a stepped increase in the annual woodland creation rates from 2020/21." ³ Policies which contribute to the delivery of policy outcome include:

1. Forestry grants
2. Woodland creation
3. Awareness raising
4. Meeting woodland standards

5. Woodland Carbon Code accreditation

6. Development of forestry and woodland strategies

233. Proposals which contribute to the delivery of policy outcome 1 include improvements to the Forestry Grant Scheme application process, identifying investment opportunities for woodland creation, targeted grants measures and a review of Forest Enterprise Scotland's woodland creation activity.

234. The majority of witnesses who commented on forestry expressed confidence that these targets can be met within the proposed timescales if the current cross-party consensus and commitment to forestry remains.

Planting targets

235. Through its previous scrutiny into the forestry sector³⁴ the Committee is aware of the issues which has meant that the Scottish Government has failed to meet planting targets to date. Reasons include, issues with the grant structure and application process as well as the inability to identify suitable land for afforestation. The Committee expects that the recommendations as put forward by the recent Mackinnon report, and agreed by the Scottish Government, will help to address many of these points.

236. With this in mind there were still a number of representations put forward in written and oral evidence on these subjects. Highland and Island Enterprise (HIE) noted the aspiration to move from 18% of forest cover to 21% by 2032. It cautioned that based on past planting rates it is likely there will be significant challenges in securing the land to achieve this ambitious target, and in supplying the nursery stock to deliver the planting. It also advocated the promotion and development of a 'forest culture'. It was of the view that this would help to address some of the challenges that are likely to arise as a result of the ambitious planting targets where there are competing land-uses.

237. Reforesting Scotland states that it welcomes the increased woodland creation targets but feels that there is room for further ambition. It felt that the aim of 21% forest cover was low considering that the European average is closer to 33%. While Scotland has larger areas than most European countries which are naturally treeless, it argued that a target of 25% ought to be reasonable and achievable.

238. Jo O'Hara from the Forestry Commission outlined the work that the Scottish Government is doing in order to identify land for planting. For example, it is working with NFUS and CONFOR in order to encourage farmers to plant trees, and is sending land management experts to assess individual farms to make best use of the land available for trees.

239. In written evidence to the Committee, the Scottish Government indicated that the proportion of broadleaved woodland on Scotland's National Forest Estate is forecast to increase to around 20% (c 70,000 hectares) in accordance with long term land management plans. It stated that this will improve the species diversity of the Estate, leading to increased resilience to climate change and tree health risks. It advised that careful forest planning and the use of appropriate planting and management methods will help to create the right conditions for productive

broadleaved management and future hardwood timber production on the Estate without impacting upon the volume of coniferous timber produced.

240. The Committee noted that the Scottish Government has accepted the recommendations as set out in the Mackinnon report to improve and streamline the forestry industry and to help achieve its planting targets. It calls on the Scottish Government to include an action in the Climate Change Plan to keep the progress on the implementation of the Mackinnon recommendations under review.
241. In addition to increasing its commercial forestry levels the Committee calls on the Scottish Government to include targets for hardwood and native broadleaf trees in order to maximise biodiversity and to increase resilience to pests and diseases. Both of these measures will help improve the maintenance of Scotland's woodlands and therefore carbon capture.
242. The Committee further calls on the Scottish Government to improve the levels of community engagement in order to mitigate any objections or complaints concerning new forest developments and land-use changes.

Wood for construction

243. Forestry policy outcome 2 of the Draft Climate Change Plan regards the use of wood in construction. It states that it will "increase the use of sustainably sourced wood fibre in downstream industries, such as construction, to reduce emissions by substituting higher embodied carbon construction materials with wood products"³. Policies include the implementation of the Timber Development Programme through an annual programme of projects.
244. The Scottish Government objective is to increase the use of Scottish wood products in construction from the current level of 2.2 million cubic metres to 3.0 million cubic metres by 2031/32. Stakeholders who commented on forestry welcomed the increased use of timber in construction.
245. CONFOR noted that innovations are taking place to use wood in a wider range of construction. However, it called for greater links between forestry and other areas and noted that the industry can face a lack of understanding of how wood is a suitable product for construction and, in some cases, constructors may over-specify the quality of the wood required. Scottish Land and Estates said—
- ” We would add that there is a strong need to publicise to (builders, designers, architects) the real potential of timber and indeed the necessity of using more timber in house building. Despite a lot of work being done there remains a lack of architects and builders using wood to a full range of its potential. This may be because of concerns over consistent timber quality from Scottish woods.³⁵
246. HIE noted that there is competition from the Biomass energy sector for timber and fibre resource, which is having an impact on prices. It advocated that timber should only be being diverted to energy use when other higher value options have been

exhausted. Professor Pete Smith from Aberdeen University also noted that waste wood that cannot be economically recycled could be used for fossil fuel substitution in energy generation, i.e. biomass energy. He suggested that this could be added as the residual end use for waste wood, to contribute to greenhouse gas reduction targets.

247. The Cabinet Secretary outlined how the Scottish Government will work with the whole forestry sector from plant nurseries to sawmills in order to provide more trees to harvest for use in construction.
248. The Forestry Commission noted that previous planting of hardwood trees was with carbon sequestration and biodiversity in mind, not construction. Therefore it may not be of sufficient quality for some construction requirements. It noted that work has been done over the past twenty years in order to address this issue.

249. The Committee believes that focus is required to raise awareness in the construction industry and increase the use of timber. It calls for the Scottish Government to consider how it may support the improved education, awareness and uptake in the industry.

Additional areas for inclusion

250. The Committee asked witnesses what they would like to see included in the Climate Change Plan which is not currently present. Suggestions included detail on the location of tree planting, better management of existing woodland, improving subsidy regimes and making better use of integrated land-use strategies.

Location and type of tree planting

251. Dr Robin Matthews of the James Hutton Institute commented in oral evidence that the forestry targets in the Climate Change Plan are purely area based and there seems to be an omission in terms of quantifying or considering the actual amount of CO₂ that will be saved. He said—

” ... the amount of savings that can be made depends on where the trees go. We can be pretty successful at achieving a planting area target without necessarily achieving a CO₂ reduction target. That is an important thing to consider. As far as I can see, the current Climate Change Plan presents no target on emissions reduction.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Professor Matthews, contrib. 289³⁶

252. Professor Matthews also noted that planting trees can cause sizeable soil disturbance and therefore increase CO₂ emissions. He highlighted to the Committee that it can take 10-15 years before the balance is restored. However, this depends substantially on the type of soil that the trees are planted in. This point was echoed by the RSPB who argued that where trees are placed on the landscape, and indeed what type of tree, is very important for the carbon balance. In particular it advocated research on the best trees to plant in shallow peat.

253. Jo O'Hara from the Forestry Commission said that the draft CCP used planting targets in terms of hectares as it is an easy metric to understand. She explained that an assumption is made into what an 'average' hectare of that forest would look like. This is then converted into the level of Co2 reduction expected, which is anticipated to be 7 tonnes per hectare, per year.
254. Ms O'Hara also noted that Scotland has gaps in the scientific knowledge regarding the anticipated carbon reduction dependent on soil and tree type. She also highlighted to the Committee that the Commission plants trees for a variety of reasons and uses, not just carbon sequestration, and that there may be a trade off required.
255. The Committee notes the explanation from the Scottish Government regarding how much CO2 the planned planting targets are anticipated to capture. It calls on the Scottish Government to clearly set out this calculation and anticipated figure in the Climate Change Plan. It also calls on the Scottish Government to give greater consideration to the research required into the benefits of planting the 'right tree in the right location' in order to achieve optimum carbon capture.

Managing existing woodland

256. Witnesses stated clearly that there is a lack of detail in the CCP regarding how we manage our existing woodland in Scotland and how we restock felled areas. Tillhill Forestry stated that the length of the rotation and the interval between felling the trees and replanting are critical when it comes to carbon capture and the contribution of forestry to the economy. The Woodland Trust noted that the Committee on Climate Change said that there was a risk of Scotland's existing woodland sequestering less carbon because of the lower proportion of young trees within it.
257. Scottish Land and Estates also noted that climate change is one of the factors that is likely to increase the risk of new tree diseases to Scotland and may be a significant risk factor to achieving carbon capture through forestry.
258. The Woodland Trust highlighted that 50% of Scotland's native woods are in an unfavourable condition, and that this is in large part down to failed regeneration and the presence of invasive non-native species. Reforesting Scotland also noted that Scotland lacks favourable conditions for the natural regeneration of woodland and that much of this is due to deer predation.
259. CONFOR felt that failure to understand the scale of the restocking issue and to tackle it effectively could begin to undermine the gains achieved from new woodland creation. It called on the final draft of the CCP to include a policy to ensure felled areas are restocked within less than five years and that the 'backlog' of restocking on the National Forest Estate is caught up.

260. The Committee believes that the Climate Change Plan lacks a focus on how it will positively manage our existing woodland. It calls on the Scottish Government

to include restocking targets and to ensure any backlog in restocking the National Forest Estate is addressed. It also calls on the Scottish Government to consider the impact that climate change may have on new species of pests and diseases and therefore the levels of carbon capture.

Subsidy regimes

261. Reforesting Scotland made the point that much of the land suitable for afforestation in Scotland, both for timber production and for native woodland is currently subsidised for other uses which may act as a disincentive for planting. Alan Carter said —

” There are competing subsidies at work that influence land managers and that situation really needs to be addressed before the targets can be met... The difference in subsidy is enormous. There is a real skew, which we have an opportunity to end.

262. CONFOR also noted the need to make it more financially attractive to plant trees as farmers will be losing CAP payments for the loss of agricultural land. It advocated that the post-CAP system should be supporting farmers and others working in the rural economy to ensure that they do not hit a break-off point when switching from agriculture to forestry activity.

263. The Committee calls on the Scottish Government to consider the funding options available to support those farmers wishing to participate in forestry activity in the context of higher payments for agriculture activity on their land and any competing subsidy requirements.

Land use

264. Witnesses highlighted the importance of land supply and the way in which the land-use strategy is implemented to identify land for planting. Scottish Woodland Trust noted that the commitment in the plan is to “support planning authorities in the development ... of local forestry and woodland strategies”³⁷. However, it was noted that the Scottish Government does not currently integrate local land-use management with strategic level plans. Scottish Woodland Trust said—

” it is entirely left to local planning authorities, which are hard pressed enough with the work that they have to do without taking on an extra element.

Source: Rural Economy and Connectivity Committee 01 February 2017 [Draft], Charles Dundas, contrib. 255³⁸

265. Scottish Land and Estates also advocated for a strategic approach to land-use in order to ensure that decisions are made in a rounded and inclusive way that fully recognises the trade-offs required when land-use changes are proposed.

266. The Committee recommends that the Scottish Government support the integration of land-use plans within the Climate Change Plan to create a regional perspective which can better consider land-use strategies at a strategic level.

Co-benefits

267. The CCP acknowledges the importance of encouraging behavioural change if targets are to be met across all transport and agriculture / forestry proposals. Alongside the Draft Climate Change Plan, the Scottish Government published a number of accompanying documents that explore some of the potential co-benefits associated with climate change mitigation measures, including:
- [Evidence Review of the Potential Wider Impacts of Climate Change Mitigation Options: Transport Sector.](#)
 - [Evidence review of the potential wider impacts of climate change Mitigation options: Agriculture, forestry, land-use and waste sectors](#)

Transport

268. Overall, the evidence base suggests that there are a number of potential co-benefits associated with transport climate change mitigation measures and the Committee welcomes the positive impact that the reduction in transport emissions has on air quality, health, noise and congestion.
269. However, the level of benefit depends on the extent of modal shift in terms of car vehicle kilometres reduced, and where and when these reductions take place. As outlined, modal shift is not prioritised in the draft CCP. Active travel interventions can, through increased physical activity, bring about substantial health benefits. Cycling Scotland suggested that in addition to the obvious health benefits, children who engage in active travel also have improved social interaction skills and are more confident learners.
270. Some witnesses felt that reducing governmental support for car use creates a fairer and more equal society. Carplus Bikeplus noted that there will always be people who are unable to drive for a variety of reasons including cost, age and disability. It considered the historic focus on cars in town planning and infrastructure decisions discriminatory as it has increasingly led to the isolation of non-drivers who find it more difficult to access services and amenities. The impact was considered to be disproportionately felt by lower income households.

271. The Committee welcomes the decreased noise pollution and improved air quality that results from reduced transport emissions. However, it feels that greater emphasis should be given to the benefits of active travel in the plan. As modal shift to active travel has less impact on carbon abatement it also receives less attention in the CCP than other carbon reduction methods. However, it undoubtedly has significant health benefits, which should be factored in the final plan

Agriculture and Forestry

272. The Committee is content to note that most impacts of the selected mitigation options were neutral or positive, with only a small proportion of adverse impacts. There is robust evidence on co-benefits deriving from all mitigation options, with

multiple positive wider impacts from areas such as precision farming, anaerobic digestion (AD), agroforestry, optimal mineral nitrogen use, livestock health and reduced livestock product consumption. Improvements are expected in air, water and soil quality alongside crop and animal health, biodiversity, land-use etc.

273. Evidence on the impacts of some mitigation options were weak, reflecting knowledge gaps, particularly in the case of reduced livestock product consumption, livestock health and optimal soil pH, low emission storage and application of manure and more legumes.
274. The Scottish Government noted that the wider impact on areas such as soil quality, household income, consumer and producer surplus, employment, cultural and social impacts as well as human health also had a weaker evidence base.

275. The Committee calls for the Scottish Government to close its evidence gaps in terms of the wider benefits of climate change mitigation activities. In particular, this includes issues around livestock consumption and health, emissions storage and nitrogen efficiency with leguminous crops as well as human health and social impacts.
276. The Committee also calls for the Scottish Government to give further consideration to the policy areas in which the co-benefits are variable and the more targeted actions are required.

Annex A

Extracts from the minutes of Rural Economy and Connectivity Committee meetings

4th Meeting, 2017 (Session 5), Wednesday 1 February

3. Draft Climate Change Plan (RPP3): The Committee took evidence from—

- Professor Pete Smith, Chair in Plant & Soil Science, University of Aberdeen;
- Peter Ritchie, Executive Director, Nourish Scotland;
- Andrew Bauer, Deputy Director of Policy, NFU Scotland;
- Steven Thomson, Agricultural Economist, SRUC;
- Alastair Nairn, Farmer and Environmental Spokesperson, STFA;
- Professor Robin Matthews, Leader of the Nurturing Vibrant and Low Carbon Communities Research Theme, The James Hutton Institute;
- Charles Dundas, Public Affairs Manager - Scotland, Woodland Trust;
- Alan Carter, Chair, Reforesting Scotland;
- Stuart Goodall, Chief Executive, Confor;
- George McRobbie, Managing Director, Tilhill Forestry Ltd.

Written evidence

- [NFU Scotland](#)
- [Nourish Scotland](#)
- [Reforesting Scotland](#)
- [Confor](#)

5th Meeting, 2017 (Session 5), Wednesday 8 February

2. Draft Climate Change Plan: The Committee took evidence from—

- Professor Tom Rye, Director of TRI and Professor of Transport Policy, Edinburgh Napier University;
- David Beeton, Managing Director, Urban Foresight;
- Sally Hinchcliffe, Organiser, Pedal on Parliament;
- Phil Matthews, Chair, Transform Scotland;

- Dr Jason Monios, Associate Professor in Transport Planning and Geography, Edinburgh Napier University.

Written evidence

- [Pedal on Parliament](#)
- [Transform Scotland](#)

6th Meeting, 2017 (Session 5), Wednesday 22 February

2. Draft Climate Change Plan: The Committee took evidence from—

- Fergus Ewing, Cabinet Secretary for the Rural Economy and Connectivity, Gordon Struth, Head of Climate Change and Business Support, and Jo O'Hara, Head of Forestry Commission Scotland, Scottish Government;
- Humza Yousaf, Minister for Transport and the Islands, Donald Carmichael, Director Transport Policy, Transport Scotland, and Jonathan Dennis, Economic Adviser, Transport Scotland, Scottish Government.

Annex B

Written evidence

Agriculture

- [James Hutton Institute](#)
- [NFU Scotland](#)
- [Nourish Scotland](#)
- [Moredun Research Institute](#)
- [Quality Meat Scotland](#)
- [Scottish Environment Protection Agency](#)
- [Scottish Tenant Farmers Association](#)
- [Professor Pete Smith](#)
- [Soil Association Scotland](#)

Forestry

- [CONFOR](#)
- [Highlands and Islands Enterprise](#)
- [Reforestation Scotland](#)

Transport

- [Carplus Bikeplus](#)
- [Carplus Bikeplus Supplementary](#)
- [Cycling Scotland](#)
- [David French](#)
- [Ed Hawkins](#)
- [Friends of the Earth](#)
- [Mark Lazarowicz](#)
- [Paths for All](#)
- [Christopher Pearson](#)
- [Pedal on Parliament](#)

- [Transform Scotland](#)
- [The Royal Town Planning Institute](#)
- [SEStran](#)
- [Society of Chief Officers of Transport](#)
- [Spokes](#)
- [Sustrans](#)

Combined Topics

- [2050 Climate Group](#)
- [Alan Brown](#)
- [Centre for Knowledge Exchange and Impact](#)
- [Citizens Advice Scotland](#)
- [Energy UK](#)
- [Historic Environment Scotland](#)
- [Just Transition Partnership](#)
- [RSPB Scotland](#)
- [Scottish Land and Estates](#)
- [Scottish Natural Heritage](#)
- [Scottish Renewables](#)
- [Scottish Wildlife Trust](#)
- [SRUC](#)
- [Stop Climate Chaos Scotland](#)
- [Stop Climate Chaos Scotland - supplementary](#)
- [Transition Black Isle](#)
- [WWF](#)

Other

- [BT Scotland](#)
- [Food For Life](#)
- [Royal Scottish Geographical Society](#)
- [Scottish Community Alliance](#)

- [Sustaining Dunbar](#)

Annex C

Additional Information on TIMES Model

SCOPE OF TIMES MODELLING

This note provides clarification on the scope of the TIMES modelling in the development of the Draft Climate Change Plan.

Scope of TIMES models

TIMES models are used around the world for carbon planning – and the Scottish TIMES model has provided the central underpinning for our approach to every sector, albeit in different ways for some sectors. These are explained below.

Greenhouse gas emissions come from two sources – combustion of fossil fuels for energy and a number of biological processes associated with land-use, agriculture and waste. TIMES models focus on energy issues and the CO₂ emissions that arise from fossil fuels. This focus is a major strength of TIMES in that it ensures consistency between the use of energy sources and their production across a myriad of technologies and uses.

Even in those sectors where external analysis is used to generate carbon envelopes TIMES *still* operates “under the bonnet” to both balance the use and supply of energy sources and to ensure that the societal energy costs of the climate plan are calculated consistently. This consistency cannot be guaranteed if the bottom up approach used in our earlier plans were employed.

You are aware of the other benefits of the TIMES model including its ability to develop an approach to allocating emissions reduction on cost grounds that guided us throughout the development of the Plan. The energy focus in TIMES has also allowed us to develop an Energy Strategy that is consistent with the Climate Change Plan and work towards a much closer integration of our approach to emission reduction and decarbonising energy than the Government has achieved before.

Non-energy emissions

As outlined above, TIMES models focus on the CO₂ emissions that arise from fossil fuels. To provide a complete picture of greenhouse gas emissions, TIMES models across the world therefore utilise supplementary models to reinforce their analysis of non-energy (e.g. biological) emissions. In Scottish TIMES we have therefore utilised a range of additional models to ensure that all Scottish emissions are incorporated into the TIMES modelling framework.

- **Agriculture** – given the biological processes underlying methane (livestock) and NO₂ (use of nitrogen fertilisers) emissions external analysis was used to determine the bulk of the agriculture envelope. Where agriculture emissions come from the use of energy these are explicitly included in the TIMES work.
- **Waste** – similarly the nature of emissions from waste mean that an external model was used to determine the waste envelope. Additional analysis also

provided an estimate of the waste available for energy supply that is utilised by TIMES and again helps us ensure consistency.

- **Land Use, Land Use Change and Forestry (LULUCF)** – again the emission and absorption of CO₂ from land-use, forestry and peat land restoration do not arise from the demand for energy and so are outside the scope of TIMES models. We made use of a number of external models to predict the size of the LULUCF net emissions.

Transport

The final sector where TIMES was not used directly to determine the sector envelope is transport.

Scottish TIMES includes a transport sector module. We also made use of a more detailed transport model to cross check results with TIMES.

This module however was aligned with Element Energy (EE) research commissioned by Transport Scotland. This was done to take advantage of the latter, which contains more detailed sector-specific modelling of the Scottish transport sector.

TIMES modelling was *still* employed for Transport, however, even in this final run. In this run, it ensured that the energy demands for transport were still met by corresponding supplies. This is a good illustration of how the TIMES approach is able to ensure consistency by operating “under the bonnet” of the carbon envelopes imposed by external models.

Directorate of Energy and Climate Change

Scottish Government

6th March 2017

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