Committee on Climate Change

Independent advice to Government on building a low-carbon economy

Scottish Climate Change Bill – Call for Evidence

The Scottish Government has committed to introducing a new Scottish Climate Change Bill. Recognising progress in Scotland and the Paris Agreement, this will include an ambitious new target of reducing emissions by more than 50% on a gross basis against 1990 levels by 2020. In early 2017 the Government plans to publish a new Climate Change Plan and a new Energy Strategy, which together will set out their low-carbon infrastructure priorities.

The Committee on Climate Change has been asked by the Scottish Government to provide advice on how the new Bill may look and is seeking evidence to help with that task.

Scotland's current Climate Change Act sets a long-term target to reduce emissions of greenhouse gases by at least 80% in 2050 relative to 1990, with an interim target to reduce emissions by 42% in 2020.[1] Secondary legislation has also set a series of annual emission reduction targets for 2010 to 2032.

Since the Act was passed, the Scottish Government has failed to meet annual targets for 2010 to 2013, but met the 2014 target by a wide margin with reductions of 45.8% since 1990 – outperforming the level of the 2020 interim target.[2]

The measure of Scottish emissions under the existing Act has been subject to considerable variability over this period, masking underlying progress in reducing emissions. This has been due to revisions to the Scottish greenhouse gas inventory and changes in the EU Emissions Trading System (EU ETS) that affect the Scottish share of emissions in some years, together with variations in annual temperatures. The changes in the emissions inventory reflect improvements in scientific understanding which led to changes in the methodology for estimating emissions. Such improvements are welcome but they have made the existing annual targets, which are set on an absolute basis, more difficult to achieve. The fact that targets in 2010 to 2013 have been missed is largely due to these revisions. **The deadline for responses is 12 noon on 1 February 2017.** For information about how to submit your response to this call for evidence, see: https://www.theccc.org.uk/2016/12/14/call-for-evidence-scottish-climate-change-bill/

QUESTION PROFORMA

QUESTIONS

a. Appropriate level of future emissions ("targets")

A new Scottish Climate Change Act would likely be passed in 2019 and so there will not be much time for new policies to affect progress towards a 2020 target. There is scope for the new Act to include further interim targets between 2020 and 2050 (e.g. for 2030 and 2040).

In previous work for Scotland[1] we have developed a "High ambition" scenario for Scotland, through which it would be possible for Scotland to achieve a 47% reduction by 2020, on a net basis, outperforming the current 42% target.

On a gross basis our High Ambition scenario identifies a possible reduction of 57% in 2020 relative to 1990 emission levels (from emissions in 2014 that were 39.5% below 1990). This includes abatement from all sectors of the economy, with the largest abatement from the continuing decarbonisation of the power sector and increased abatement in transport.

The current 2050 target in Scotland, for a reduction of at least 80%, is based on a global path that keeps central (i.e. 50% likelihood) estimates of global temperature rise close to 2°C. The Paris Agreement contains a set of new long-term aims to limit warming, which are more ambitious that previous UN agreements. The Agreement aims to keep the global temperature rise to well below 2°C, pursuing efforts to limit it to 1.5°C. To achieve this, the Agreement aims to balance sources and sinks of greenhouse gases in the second half of the century (i.e. net zero global emissions by 2050-2100).

The CCC published a report on the implications for UK climate ambition on the 13th October.[2] This concluded that it is not appropriate to set new UK-wide emissions targets now, but agreed with the intention to set a new UK target in future that reflects the global aim of reaching net zero emissions. To be credible, such a target needs to be evidence-based, accompanied by strong policies to deliver existing nearer-term targets and a strategy to develop greenhouse gas removals. The five-yearly cycle of pledges and reviews created by the Paris Agreement provides regular opportunities to consider increasing ambition.

The Scottish context differs from that of the UK, both in terms of the existing legislation and in terms of the policy landscape. The different target mechanisms within the 2009 Scottish Act have proven to be more sensitive to inventory revisions, as set out above. Scottish Ministers have made statements regarding their wish to remain at the forefront of global ambition,[3] and have committed to a new Bill in response to the Paris Agreement.

The Climate Change (Scotland) Act 2009 allows for annual targets (i.e. those currently set for each year to 2032) and the interim target (for 2020) to be amended, within certain limits, via secondary legislation. By contrast, the long-term target for an emissions reduction of at least 80% by 2050 cannot be amended, and no further long-term targets can be added.

[1] https://www.theccc.org.uk/publication/scottish-emissions-targets-2028-2032-the-high-ambition-pathway-towards-a-low-carbon-economy/
[2] https://www.theccc.org.uk/publication/uk-action-following-paris/
[3] For example, http://news.gov.scot/speeches-and-briefings/first-minister-address-to-seanad

Question 1: To what extent is there scope to increase emission reductions now to meet a more ambitious 2020 target? (Please provide evidence where relevant.)

ANSWER:

There is scope to do more to meet a more ambitious 2020 target. However, we recommend that emission reporting is based on territorial emissions and under territorial reporting the current 42% target is equivalent to 56%. Any less ambition is not acceptable.

There is scope to do more to meet a tougher 2020 target but very little time to influence it so action would be needed now. Beyond 2020, we need to start looking at tackling consumption emissions, see Question 4.

Question 2: To what extent do you support further interim targets between 2020 and 2050 (e.g. for 2030 and 2040)?

ANSWER:

We see the value of 5 year interim targets but this should not distract from the importance of annual targets.

Question 3: What are the opportunities to reduce emissions to 2050 that go beyond our High Ambition scenario, including opportunities for greenhouse gas removal? (Please provide evidence where relevant.)

ANSWER:

We're not convinced by the mitigation assessments of the agricultural measures set out in the CCC 'High Ambitions' scenario, such as the nutrient use efficient GM crops, which don't exist yet, controlled release fertiliser and adding nitrate to cattle feed.

Much more could and should be expected of agriculture in meeting Scotland's ambitious climate change targets, and the measures required will make farming businesses more profitable and sustainable.

We could be much more ambitious on:

1 **Nitrogen budgeting**

2 **Agroforestry**

3 **Organic agriculture / Soil management**

4 **Animal health including deer management**

1.1 Nitrogen

Emissions from the production and application of bagged nitrogen accounts for around a quarter of agricultural emissions, or around **5% of Scotland's total GHG emissions**. This is from a combination of the energy used and CO2 emitted in producing nitrogen fertiliser and the N2O emitted when fertiliser is applied.

Scotland had a net nitrogen balance of 161,000t in 2015, around 87kg per hectare of all agricultural land (crops and grassland). In other words, 161,000t more nitrogen was applied to the land than was taken off in crops/livestock products. (see: www.gov.uk/government/uploads/system/uploads/attachment_data/file/552438/agriclimate-7edition-12sep16.pdf)

Many farmers could use nitrogen much more efficiently, with financial benefits for their businesses as well as environmental benefits. The cheapest measure is to test their soil and ensure that the pH is right by putting on lime as needed: the right pH makes nitrogen more available to the crop, encourages clover growth and reduces the negative effects of aluminium in the soil. Using nitrogen fertiliser tends to make soils more acid, potentially setting up a cycle where N application is increasingly unproductive.

Many other factors influence how efficiently nitrogen is used on farm, and some farmers are much better than others at putting on the right amount in the right way at the right time. This applies to the use of organic nitrogen in manures and slurries. There is limited uptake in Scotland and the UK of more efficient measures of slurry spreading methods such as injection and the use of trailing shoes. Nearly all slurry is still spread with the splash plate, which has been banned in Germany (now one of the global leaders in nitrogen use efficiency).

We recommend a programme of support to machinery rings to invest in modern spreading technology suitable for local soil conditions. This could be linked to co-operative anaerobic digestion plants, since application of digestate is also more efficient with modern methods (see: www.iea-biogas.net/files/daten-

redaktion/download/publi-task37/Digestate_Brochure_Revised_12-2010.pdf)

We recommend developing a full **nitrogen budget** for Scotland. Many countries now have established a nitrogen budget showing how nitrogen flows through the food and farming system, and highlighting opportunities for reducing losses (with benefits to farmers and the environment), which can then inform reduction targets.

Denmark, for example, has had a nitrogen budget since 1990, and this has helped to focus actions which cumulatively have halved the nitrogen losses to the atmosphere and to water. (see: https://phys.org/news/2015-09-danish-nitrogen-nutshell.html). There is an established UN methodology for this (http://www.clrtap-tfrn.org/sites/clrtap-tfrn.org/files/documents/EPNB_new/ECE_EB.AIR_119_ENG.pdf)) and Scotland hosts one of the leading global nitrogen research teams at the Centre for Ecology and Hydrology.

2. 1 Agroforestry

We need to invest much more in agroforestry. The CCC 'High Ambitions' scenario estimates that a reduction of 0.16 MtCO2e can be delivered by 2030 by establishing agroforestry on 0.6% of agricultural land area. This reduction would increase in subsequent years as schemes mature, and in our view **6% rather than 0.6 % is not an unreasonable target**, provided that the right trees are planted in the right places.

As the recent ClimateXchange briefing from Forestry Research and James Hutton Institute states:

"*Agroforestry systems can provide multiple benefits, including diversification of farm income, shelter for livestock, fuelwood, carbon sequestration, nutrient management, reductions in soil erosion and leaching, biodiversity enhancement, and amenity value.*"

(http://climatexchange.org.uk/files/4614/7619/2023/CXC-Woodlands_agroforestry_policy_brief.pdf)

Agroforestry at scale could make a significant contribution to meet the ambitious increased planting targets. We welcome the inclusion of agroforestry as a measure in SRDP but note the very low level of uptake and the lack of effective promotion of the benefits to farmers.

Scotland is leading the UK in implementation of the Woodland Carbon Code that validates claims about carbon sequestration and thus is able to attract private finance investment. This could be extended to well-planned and well-executed agroforestry schemes.

At farm level, agroforestry should be discussed as an option as part of carbon audits and whole farm reviews. At regional/landscape level, co-operative schemes for agroforestry at scale should be promoted.

3.1 Organic agriculture / soil management

We call for **an ambitious target for organic farming** (eg 5% of land in each of the three CAP 'regions' to be organic or in conversion by 2020). The Scottish Government's 2016 Organic Ambitions plan specifies in detail the links between organic production and meeting climate change targets. (http://www.gov.scot/Publications/2016/01/4353)

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. (Lynch, D. et al The Carbon and Global Warming Potential Impacts of Organic Farming: Does It Have a Significant Role in an Energy Constrained World? *Sustainability* 2011, *3*, 322-362; doi:10.3390/su3020322)

For example, in a study of fifteen Irish farms engaged in suckler-beef production (five conventional, five in an Irish agri-environmental scheme, and five organic units), the average emissions from the conventional units were around 15% higher per kg of beef than the organic units, and more than twice as high per hectare (Casey, J.W.; Holden, N.M. Greenhouse gas emissions from conventional, agri-environmental scheme, and organic Irish suckler-beef units. *J. Environ. Qual.* **2006**, *35*,231-239.)

In addition, organic management typically leads to higher soil carbon sequestration (Gattinger, A. et al http://www.pnas.org/content/109/44/18226)

There are many reasons for this. Organic farming does not use bagged nitrogen (as outlined above, a major contributor to GHG emissions in agriculture), relying more on biological nitrogen fixation from clover and other legumes. It also uses much lower levels of anthelmintics and antibiotics, both of which can have adverse impacts on soil biota, particularly dung beetles. Dung beetles help to reduce greenhouse gas emissions from cow pats by up to 7% and by the pasture as a whole by 12%. (http://www.nature.com/articles/srep13912 & http://www.nature.com/articles/srep18140)

Organic standards also ensure a number of co-benefits such as inspections of animal welfare, antibiotic use, prohibition of GM feed.

4.1 Animal health

Besides being a major animal welfare issue, focussing on improving animal health would help to lower GHG emissions in agricultural systems by increasing resource efficiency. Farmers need much more proactive support from vets and agricultural advisors on this front. Investing in organic production overall would put animal health on the forefront too, as this forms part of the organic certification scheme.

Question 4: Should the 2050 target be more ambitious than the existing level of 'at least 80%'?

ANSWER:

Yes – the existing target is based on achieving 2C but Paris Agreement aims for 1.5C.

Additionally, we should start looking at consumption or extra-territorial emissions. We're currently not measuring nor tackling the climate impact of a major part of our consumption of food and drink (as well as our purchase of other imported goods).

The Scottish Government estimates Scotland's total consumption emissions to be 77.1 $MtCO_2e$ in 2012, a 5.3% increase from 2011 (Scottish Government (2012), Scotland's Carbon Footprint 1998-2012, available at: http://www.gov.scot/Resource/0047/00472991.pdf)

The Scottish Government, along with most governments around the world, has tended to look at food and climate change in terms of domestic agricultural production emissions. However, the total environmental impact of our food system is ultimately driven by consumption, and while there

have been reductions in production emissions from agriculture since the baseline year of 1990, in Scotland we are increasingly reliant on imports and consequently outsourcing the environmental impact of our food supply: In 2008, 48% of the total UK food and feed was imported from abroad (de Ruiter, H., Macdiarmid, JI., Matthews, RB., Kastner, T. & Smith, P. (2016), 'Global cropland and greenhouse gas impacts of UK food supply are increasingly located overseas'. *Journal of the Royal Society Interface*, vol 13, no. 114, available at: http://rsif.royalsocietypublishing.org/cgi/reprint/rsif.2015.1001?ijkey=OzaOlLz1rfgC0dn&keytype=ref)

It is estimated that the impacts associated with our consumption of food in the UK amounts to 19% of total consumption-related emissions. (Garnett, T. (2008), Cooking up a storm; Food, greenhouse gas emissions and our changing climate, *Food Climate Research Network*, available at: http://www.fcrn.org.uk/sites/default/files/CuaS_web.pdf)

When the emissions arising from deforestation or other land use change overseas that are caused by farming to produce food for consumption in Britain is included in the analysis, this figure increases to an estimated **30% of all consumption emissions**. (Audsley, E., Brander, M., Chatterton, J., Murphy-Bokern, D., Webster, C., and Williams, A. (2009), How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope for reduction by 2050. WWF UK, available at: http://assets.wwf.org.uk/downloads/how_low_can_we_go.pdf)

This puts **Scotland's 2012 food consumption emissions at 14.649 $MtCO_2e$** (excluding land use change) and an estimated **23.13 $MtCO_2e$ including land use change**.

The Scottish Government estimates that Agriculture and Related Land Use emissions came to 12.4 $MtCO_2e$ in 2013. Given this is a fraction of the estimated consumption emissions, in order to take appropriate measures to tackle climate change and reduce the true climate impact of our food supply as well as other imports, we think it is crucial, and morally obligatory, to focus on Scottish consumption emissions as well as those from production.

Question 5: Should there be a target for net-zero emissions for Scotland, and if so for when and on what basis?

ANSWER:

Yes there must be a target for net-zero emissions. This should be a net-zero GHG emissions (rather than net CO2) by 2050.

Our recommendation is based on interpretation of CCC advice to the UK and other information as there is currently no advice specific to Scotland.

This level of ambition is consistent with the advice to the UK Government on UK targets. It reflects the increased ambition needed to meet an aim of 1.5C.

Question 6: If it is not currently appropriate to set a target for net-zero and/or to adopt a more ambitious 2050 target, should provision be made within the new Bill to do so at a later date?

ANSWER:

Not applicable based on above answers

b. Duration and form of future carbon targets (one year or multi-year, absolute or percentage)

Scottish targets for 2020 and 2050 are currently set as percentage reductions from a 1990 baseline. Annual targets have been set on an absolute ($MtCO_2e$) basis.

Annual targets allow for continued assessment of progress and provide greater certainty as to the magnitude of emission reductions that need to be made at any given time. However the ability to meet them can be affected by annual fluctuations in emissions caused by weather or unforeseen factors, while the delay in greenhouse gas inventory data for Scotland means that progress against targets is assessed two years after the target year.

Multi-year targets, such as five-year budgets under the UK-wide Climate Change Act, provide greater smoothing of these annual fluctuations, while allowing for monitoring of progress towards longer-term emission reduction targets.

Targets on an absolute basis allow for assessment towards total cumulative emissions; however, revisions to the greenhouse gas inventory can make them harder or easier to meet without reflecting actual progress in reducing emissions. This can be more pronounced in Scotland, which as compared with the UK as a whole has a much higher share of emissions from agriculture and land use, in which most revisions occur.

Percentage reductions would be less affected by these revisions, but targets on a percentage basis are less strongly linked to the best scientific estimates of the absolute level of emissions, which are the fundamental driver of climate change.

When the current 2009 Act was set annual absolute targets and interim percentage targets aligned. However, subsequent revisions to the greenhouse gas inventory have 'shifted' the baseline and led to these targets diverging from each other, potentially creating confusion and a loss of transparency.

Question 7: Should Scottish targets be set on an annual basis or covering multiple years? If on an annual basis, what can be done to minimise the impact of confounding short-term factors (e.g. weather) on meeting them?

ANSWER:

Annual basis – this has served Scotland well thus far in keeping Government to account.

To minimise the impact of short-term factors Government should set policies designed to exceed the annual targets in order to give solid contingency.

Question 8: Should targets be set on percentage or absolute terms?

ANSWER:

We prefer absolute emission targets because it shows exactly what is put into the atmosphere. However, baseline changes in future are inevitable and need to be included at the earliest opportunity in order to encourage policy uptake and behaviour change. Annual targets set on percentage terms would facilitate inventory changes. The downside to percentage targets is that more emissions can actually be emitted.

As a compromise we recommend an adjusted absolute emissions target be used which adjusts for any inventory changes and annual weather related factors. This adjusted absolute target would more accurately show the impact of policy on achieving the annual and interim targets.

Question 9: What else can be done to make targets resilient to future revisions to the emissions inventory?

ANSWER:

Our answer above shows that either percentage based targets or adjusted absolute targets can make targets resilient to inventory revisions.

c. Future accounting framework

The Scottish Government has committed to moving to a gross emissions accounting framework (i.e. actual emission reductions from all sectors of the economy will count towards the targets), as opposed to the net basis used in the 2009 Act.[1] A move to a gross framework aims to increase transparency around progress to targets in Scotland.

A change to gross accounting framework raises issues of;

- Whether there remains a role for credit purchase in such an accounting framework. The existing Act allows for credit purchase as a means to meet targets, although it also places further targets for "domestic effort" alone. To date, the Scottish Government has not purchased any such credits. Were it to do so, these would need to be procured through a programme that meets a required standard.
- How the role of emissions trading schemes (such as the EU ETS) should be reflected in such an accounting framework

Depending on the future relationship with the European Union, participation in the EU Emissions Trading System (EU ETS) may or may not continue.

Question 10: What is the role for credit purchase to supplement action to meet gross targets?

ANSWER:

Credit purchase has not been used in the past. We recommend that credit purchase is not included in the new Act.

Question 11: How should the role of the EU ETS, or other trading schemes, be reflected in the emissions accounting framework used for reporting progress to targets?

ANSWER:

We recommend that emissions move to territorial based reporting, which does not adjust for the EU ETS. However, we recommend that in its reporting Government continues to give information on Scotland's share of ETS.

Question 12: Are there any competitiveness implications for current traded sector business (e.g. industry) to moving to gross targets in Scotland, and if so how could they be minimised?

ANSWER:

d. Criteria for setting future targets

The current Climate Change Act includes target setting criteria which must be taken into account prior to targets being legislated. These are:

a. Scientific knowledge about climate change
b. Technology relevant to climate change
c. Economic circumstances, in particular the likely impact of targets on –
    - The Scottish economy
    - The competitiveness of particular sectors of the Scottish economy
    - Small and medium-sized enterprises
    - Jobs and employment opportunities
d. Fiscal circumstances, in particular the likely impact of targets on taxation, public spending and public borrowing
e. Social circumstances, in particular the likely impact of targets on those living in poorer or deprived communities
f. The likely impact of targets on those living in remote rural and island communities
g. Energy policy in particular the likely impact of the target on energy supplies, the renewable energy sector and the carbon and energy intensity of the Scottish economy
h. Environmental considerations and, in particular, the likely impact of the targets on biodiversity
i. European and international law and policy relating to climate change

Question 13: Are the current target setting criteria listed in the Act still appropriate? Are any missing?

ANSWER:

The above criteria are appropriate but there are a few missing:

- The Sustainable Development Goals and how the targets set would help to deliver these goals;

- How the targets sit with Scotland's ambitions to become a Good Food Nation, in the light of the up-coming Good Food Nation Bill –of which the consultation will start in autumn 2017;
- The impact of targets on public health;
- The impact of targets on animal health;
- The impact of targets on soil health (which can be included in environmental considerations);
- As part of criterion e.) "social circumstances", the Food Insecurity Experience Scale (FIES) should be considered, which is now included in the Scottish Health Survey.