NIEL response to AERA Committee on climate change no 2 bill

Comments by

Northern Ireland Environment Link

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Northern Ireland Environment Link (NIEL) is the networking and forum body for non-statutory organisations concerned with the natural and built environment of Northern Ireland. Its 66 Full Members represent 190,000 individuals, 262 subsidiary groups, have an annual turnover of £70 million and manage over 314,000 acres of land. Members are involved in environmental issues of all types and at all levels from the local community to the global environment. NIEL brings together a wide range of knowledge, experience and expertise which can be used to help develop policy, practice and implementation across a wide range of environmental fields.

These comments are made on behalf of Members, but some members may be providing independent comments as well. If you would like to discuss these comments further, we would be happy to do so.

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1. The Bill Objectives

The objectives of the Bill are to:

- **Set targets for the years 2050, 2040 and 2030 for the reduction of greenhouse gas (GHG) emissions**;
- **Provide for a system of carbon budgeting**;
- **Provide for reporting and statements against the targets and budgets**;
- **Provide for the ability to impose climate change reporting duties on public bodies**;
- **Provide for reports and advice from the UK Committee on Climate Change (CCC)**

(a) What are your views on the bill

Broadly negative.

Please give a reason for your answer

The objectives of the climate change no 2 bill are unacceptably weak, unambitious and liable to be changed at the sole discretion of the department (DAERA). The climate change no 2 bill also lacks essential components of suitably ambitious climate change legislation namely:

(1) A net zero target for GHG emissions, preferably by 2045 or earlier but no later than 2050

(2) A requirement for Climate Action Plans (CAPs) and carbon budgets for all sectors

(3) A mechanism for independent scrutiny through a NI based Climate office and Climate Commissioner

(4) Provision for a just transition which will help support sectors move to net zero.

The climate change no 2 bill, as introduced to the NI Assembly on 5th July 2021 by the AERA Minister does not include provision for all four points listed above and as such NIEL does not support the climate change no 2 bill.
(b) Do you think the bill will meet these objectives

Yes.

Please give a reason for your answer

While NIEL is of the view that climate change no 2 bill, in effect, already meets the objectives set in the climate change no 2 bill, this is mainly because the stated objectives are about nothing more than ensuring that a particular form of words is in place. For example, one of the objectives of the bill is to “Set targets for the years 2050, 2040 and 2030 for the reduction of greenhouse gas (GHG) emissions”. The climate change no 2 bill sets targets for those years for reducing GHG emissions and so, in that respect, that objective is already achieved. The important point is that the detail of how those targets are to be achieved is not given. In theory, the targets could be to reduce GHG emissions by a further 1% by each year stated, or even to limit the increase of GHG emissions to a particular percentage by the years stipulated and the objective would have been met. In this context, the objectives listed above in Q1 are meaningless. The objectives simply state the preferred form of words to be used in the bill. Similarly, the climate change no 2 bill also provides for a system of carbon budgeting and the other components of the bill as listed. As such the objectives will have been achieved, if the climate change no 2 bill is passed. However, setting a target or making a provision for something does not mean that target will be met or the necessary outcome(s) will be achieved. As such, the objectives listed above mean very little as NIEL contends that the objective of any good climate change legislation for NI is not just to set targets but to set appropriately ambitious targets and to ensure, as far as possible, that they are achieved and having a delivery plan to map out how the target(s) will be achieved will also be necessary. This is the role of the Climate Action Plans, as outlined in the Private Members Bill (PMB) or climate change no 1 bill. However, since the climate change no 2 bill does not provide for climate action plans, it is less likely that the outcomes, which lack appropriate ambition anyway, will be achieved.

2. Emissions Targets

Clauses 1-3 of the Bill set the following GHG emissions targets for NI, compared to baseline levels (either 1990 or 1995 emissions, depending on the particular gas)

- Net emissions will be at least 82% lower by 2050
- Net emissions will be at least 69% lower by 2040
- Net emissions will be at least 48% lower by 2030

a) What are your views on these emissions targets?

Tell us your views
The target for 2030 is not too far from what the scientific evidence suggests is necessary, i.e. a reduction in GHG emissions of approximately 50% by 2030 and as such is within the range of what is acceptable. According to the UN Intergovernmental Panel on Climate Change (IPCC) 2018 Special Report on global warming of 1.5°C, in model pathways with no or limited overshoot\(^a\) of 1.5°C, global net anthropogenic CO\(_2\) emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range), (para C.1 page 12). In this context a GHG reduction of at least 48% by 2030 in NI is acceptable.

However, the targets for 2040 and 2050 lack ambition and fall short of what NI could and should aim for and as such are not acceptable. There is also the issue that paragraph 4 (1) in part 1 of the climate change no 2 bill gives the department the authority to change the targets for 2030, 2040 and 2050 both in terms of the amount of emissions reductions to be achieved and the date by which those reductions are to be achieved. In other words, DAERA has the power to change the targets if it decides to and as such the targets in the bill are not really fixed targets at all.

**b) Do you think these emissions targets are achievable?**

Yes.

NIEL believes these targets are achievable because NIEL believes much higher, more ambitious targets are achievable. In fact, NIEL believes that reaching net zero GHGs is achievable by 2050, or even earlier, if the will is there to do so. As such, there is also very little to be gained in asking for views as to whether or not a target is achievable when that target lacks appropriate ambition.

**c) Do you think that the timescales to deliver the emissions targets are achievable?**

Yes.

As above, NIEL believes these targets are achievable because NIEL believes much higher, more ambitious targets are achievable. In fact, NIEL believes that reaching net zero GHGs is achievable by 2050, or earlier, if the will is there to reach do so.

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\(^a\) According to the IPCC Special Report on 1.5°C, ‘1.5°C limited-overshoot’ means those emissions pathways limiting warming to below 1.6°C and returning to 1.5°C by 2100.
3. Power to Amend Targets

Clauses 4 and 5 of the Bill give the Department for Agriculture, Environment and Rural Affairs (DAERA) the authority to change, through regulations, the emissions targets, years and baseline. A proposed change must be ratified by the Assembly.

DAERA may only bring forward a proposed change if:

(1) It is satisfied that it is justified on the basis of significant developments in law/policy, scientific knowledge or technology relevant to Climate Change and the UK Committee on Climate Change (CCC) has advised that the change is the most ambitious that it could be (if relevant); OR

(2) The CCC has recommended the change (or it is not substantially different from a CCC recommendation)

a) Do you think that this is appropriate?

No.

b) What are your views on this?

Tell us what you think about amending targets

NIEL does not support the proposal to give the department the sole power to change targets if it decides to do so. According to the climate change no 2 bill, if the department does decide to change a target or targets the role of the Assembly is only to ratify that change. This also limits the role of the Assembly as it can not make any changes to targets. Given that, according to the climate change no 2 bill, the only advice the department is to take in to account is the advice of the CCC, this further weakens the accountability mechanisms. In this way the climate change no 2 bill has greatly reduced accountability (and virtually none) compared to the provisions of the PMB. The present AERA Minister said in the Assembly he did not believe there was a climate emergency\(^2\), though a climate emergency was subsequently declared by the NI Assembly on 3\(^{rd}\) February 2020\(^4\) and NI has already had an environment Minister who said he did not believe in climate change\(^5\) and it would not be appropriate for someone who is not convinced of the need to appropriately tackle climate change to be able to direct the department to significantly alter NI’s climate change targets so they are weakened, without other accountability mechanisms being in place and it appears that the wording of the climate change no 2 bill opens to door to that possibility.

The principle of amending targets is fine. In fact, NIEL believes it is an essential aspect of such a bill. The issue is on what basis targets are to be amended. NIEL believes that targets should only be amended to better align with the best available scientific evidence and/or relevant policy and/or legal position such as if the UK net zero GHG target was brought
forward. The theoretical possibility of targets being weakened is a concern. As such, the wording of the climate change no 2 bill needs to be reviewed. The PMB or climate change no 1 bill allows targets to be brought forward but not pushed back. A mechanism of that nature would be appropriate but the proposal in the climate change no 2 bill is unacceptable.

4. Carbon Budgets

The Bill proposes that DAERA will prepare “Carbon Budgets” that will set the maximum GHG emissions level for NI for a period of time.

The first Carbon Budget period is planned to cover 2023-27 and thereafter Budgets will be set on a 5-yearly basis.

The Carbon Budgets will be established to help meet the overall emissions targets for 2030, 2040 and 2050.

DAERA will be responsible for submitting a report to the Assembly outlining the policies that will be taken forward by NI Government Departments to meet a Carbon Budget. This report must be submitted before the end of Year 1 of the Carbon Budget period.

a) What are your views on this?
Tell us what you think about Carbon Budgets

NIEL supports the use of carbon budgets as a well established and necessary approach. Under the UK Climate Change Act of 2008 and 2019 five year carbon budgets are set based on the advice of the CCC and this is a sensible approach that NI should replicate.

b) Do you think the proposed Carbon Budgets are an effective way of delivering on the emissions targets?

Yes

Please give us a reason for your answer
c) Clause 15 of the Bill allows DAERA to adjust a Carbon Budget by carrying a proportion of the emissions level forwards or backwards to a different Carbon Budget period (up to a maximum of 1% of the later Budget) after consulting other Government Departments and the CCC. Do you think that this is appropriate?

Unsure

Please give us a reason for your answer

The CCC has previously advised against the transfer of effort between budgets

5 Progress reporting

The Bill requires DAERA to submit reports to the Assembly as follows:

- An interim progress report must be laid before the end of Year 3 of each Carbon Budget period
- A Final Statement must be laid within 24 months of the end of a Carbon Budget period outlining whether the Carbon Budget was, or was not, met. If not met, a report must be laid within 3 months outlining proposals to compensate for the excess emissions.
- A Compliance Statement must be laid within 24 months of the end of each respective year for 2030, 2040 and 2050, with an assessment as to whether the relevant emissions target was achieved

a) Do you think that this is an effective way to monitor progress?

Unsure

b) Please tell us your views on the proposals for progress reporting as outlined in the Bill:

Please tell us your views

This appears to be no more than a reporting mechanism whereby the NI Assembly is informed of progress. NIEL is concerned at the lack of accountability and scrutiny resulting from the clauses of the climate change no2 bill.
6. Independent Oversight

Part 4 of the Bill outlines the responsibilities of the CCC in terms of reporting to DAERA on the effectiveness of Carbon Budgets and attainment of the emissions targets.

The CCC will report to DAERA within 6 months of publication of a Carbon Budget Final Statement and the Compliance Statement for years 2030 and 2040, with its consideration on whether the emissions levels have been achieved and any recommendations.

DAERA will send the Assembly a copy of each CCC report within 6 months of it being received.

a) What are your views on this?

Please tell us your views

The climate change no 2 bill proposes that independent oversight can be provided by the Climate Change Committee (CCC) alone. The CCC is the statutory advisory body for the UK in relation to the UK Climate Change Bill and is undoubtedly an expert body and is highly regarded by many. However, NIEL believes it would be inappropriate to rely solely on the CCC for independent oversight and believes that a NI based climate office and a climate commissioner will be necessary in order to provide the appropriate level of independent NI expertise, advice and scrutiny.

The lack of independent scrutiny in the climate change no 2 bill is a serious failing of the bill. The PMB ensures scrutiny and approval by the NI Assembly is required for CAPs and this level of transparency and accountability is essential. However, the climate change no 2 bill proposes that the UK Climate Change Committee (CCC) will report periodically on the progress made in terms of meeting GHG emission targets and will make recommendations as required. These reports will be laid before the Assembly but that appears to be just a reporting mechanism as it appears the Assembly can not amend the department's plans or compel it to act in certain ways so the department is in effect left to its own devices to correct its own performance. The CCC will send a report to DAERA by the end of 2027 outlining its consideration of the progress made towards meeting the emissions targets, the Carbon Budgets that have been set, the likelihood of achievement and any further measures that may be required to meet the targets and budgets. This total reliance on the CCC excludes the NI Assembly and any independent NI specific advice, research or input even from the UK government and because of how the climate change no 2 bill has been written, also excludes any international advice such as from the IPCC or other UN bodies as well as the RoI Climate Advisory Council. No matter how clear for example, the IPCC's evidence or recommendations may be, as far as the departmental bill is concerned that will not be relevant. This is a major weakness of the climate change no 2 bill. It is important that the Climate Commissioner is independent of government and free to be critical of departmental plans and policies as appropriate. The Commission must be able to speak freely without fear of funding cuts or political interference.
7. Responsibilities on Government Departments and Public Bodies

The Bill places primary responsibility on DAERA for setting Carbon Budgets, reporting on progress and consulting with the CCC.

It also requires all local Government Departments to ensure that GHG emissions do not exceed the set Carbon Budget for any period and to provide DAERA with relevant information and data to support completion of progress reports.

a) Do you think that the responsibilities on Government Departments set out in the Bill are appropriate?

No. NIEL believes each government department will need to produce a climate action plan to outline how in the areas for which it is responsible it will contribute to achieving the appropriate climate goal, which NIEL believes should be net zero GHG emissions no later than 2050.

b) Under Clause 21 DAERA may impose Climate Change reporting duties on specified public bodies following consultation with the organisation/entity concerned. What are your views on this?

8. Resource Implications

DAERA estimates that the indicative net additional cost of the Bill between 2022 and 2050 could be over £4 billion (approx. £140 million per year).

It is projected that the additional resource costs will be less than 1% of 2018 GDP each year through to 2050 and there will be a significant requirement for capital investment to put in place appropriate and effective low-carbon infrastructure and technologies.

a) What are your views on this?

NIEL regards the investment to achieve net zero carbon as necessary. The CCC has been clear on the significant economic benefits that can be created by achieving net zero GHG emissions. The CCC found that
“the net costs of the transition to net zero by 2050 (including upfront investment, ongoing running costs and costs of financing) will be less than 1% of GDP over the entirety of 2020-2050, lower than we concluded in our 2019 Net Zero report.”

Modelling commissioned for the CCC Sixth Carbon Budget report suggests achieving net zero in the UK will give a boost to UK GDP growing to around 2% of GDP by 2030, with an accompanying boost to employment of around 1%. According to this analysis the GDP boost will continue growing after 2030 before levelling off at around a 3% boost by 2050. The CCC goes on to say that considering the various economic models and evaluations, the investment programme for achieving net zero set out in section 2 of the Sixth Carbon Budget report "can provide a significant economic boost in the coming years and support the UK’s economic recovery.”

Wholesale economic analysis has not yet been carried out as to the potential economic benefits of a net zero GHG Northern Ireland but it is clear that moving to a net zero carbon economy also offers massive potential economic benefits. As the AERA Minister has said in the Foreword to the DAERA climate change bill discussion document “tackling climate change should be viewed not just as an environmental challenge, but also as an economic opportunity”.

It is clear that investing in a green economy and zero carbon options can also save money in the long term. This was supported by the CCC which said in its Sixth Carbon Budget report (page 261) that

“Around half of the measures to reduce emissions are expected to be cost saving by 2050, primarily decarbonising electricity and surface transport.”

It is also clear that there will be costs if we do not act, and those costs are projected to be much higher than the costs of investing in a green, low/zero carbon economy. DAERA summed up the implications arising from any delay in cutting GHG emissions when it said in the Discussion Document on a NI Climate Change Bill “the rate at which we reduce our GHG emissions is at least as important as emissions levels at specific points in time. Consequently, the later cuts are made, the greater they must be to achieve the same long-term goal, and so they will be more expensive to implement;”

A number of scientific studies suggest a 2°C temperature could cost 15% of GDP, a 3°C rise 25% of GDP, and 4°C could cut over 30% from GDP. The Stern Review estimated the
costs of inaction at 5% of GDP per year rising to as much as 20% a year\textsuperscript{13}. It is clear that inaction will cost more than action.

The CCC provided further detail on the financial implications of net zero in a letter to the AERA Minister dated 1\textsuperscript{st} April 2021\textsuperscript{14} when it said the following:

“A slower path to decarbonisation in Northern Ireland would bring large-scale risks that would be difficult to manage”

“In addition to green recovery opportunities and the investment requirements and operational savings, there is overwhelming evidence that reducing greenhouse gas emissions will be beneficial to public health in Northern Ireland.”

“Business models that are not compatible with a Net Zero future are increasingly risky.”

“Our scenarios require that almost all new purchases and investments in Northern Ireland are in zero-carbon solutions by 2030 or soon after, and virtually all technology in Northern Ireland is zero-carbon by 2050.”

“We are not therefore able precisely to calculate the costs of Northern Ireland reaching Net Zero”

One of the most effective drivers for mitigating climate change in Northern Ireland is to set the right policies. This notion is supported by the findings of a 2011 report by the London School of Economics\textsuperscript{15} which concluded:

“credible long-term policy signals could leverage finance and unlock private investment in renewable energy, smart networks and communities, energy efficiency and low carbon vehicles on a great scale”.

The report argued that as regards investment in low-carbon technologies

“The issue is a lack of confidence to invest rather than a lack of liquidity.”

NIEL believes that sending clear a policy signal with a net zero GHG target for NI is the best option.
b) What do you think are the most important issues for government to consider when making funding plans to help achieve the aims of the Bill?

The achievement of net zero GHGs no later than 2050.

Since there is, in effect, no roadmap for how a developed highly carbon dependent economy can transition to a net zero GHG economy in under 30 years, the focus must be on achieving the ultimate outcome, of achieving net zero GHGs and the appropriate funding needs to be provided in order to achieve that goal.

9. Access to Specialist Advice

The CCC is the sole source of expertise provided for in the Bill to give advice to DAERA in relation to Climate Change mitigation and DAERA must consult the CCC before initiating any proposed change to Carbon Budgets or emissions targets.

a) Do you think that this is appropriate?

No.

b) Are there other sources of expertise that may be needed to inform Climate Change policy and to report on progress in terms of meeting the emissions targets?

NIEL believes it is inappropriate to limit the source of expert advice solely to the CCC. The CCC is a highly respected body and is the statutory advisor to the UK government and as such NIEL supports CCC continuing to provide advice to the UK government on achieving its climate change targets, in particular on achieving net zero GHGs. However, the advice and recommendations from the CCC may be limited by UK Government policy and as such NIEL believes it would be inappropriate to rely solely on advice from the Climate Change Committee, not least because there is a need for all island co-operation on climate change in NI.

NIEL believes it would be wise to take advice from the Climate Advisory Council as well as other bodies such as Met Eireann, the Met Office, NGOs and international bodies such as the UN IPCC and third level educational establishments so as to keep up to date with the latest research and potentially others that the Climate Commissioner and/or Climate Office regards as appropriate to try to ensure that NI’s response to climate change takes account of NI’s circumstances.
10. Transboundary Considerations

a) What are your views on how the Bill addresses transboundary issues in relation to Climate Change? By transboundary we mean different countries and/or jurisdictions working together.

The climate change no 2 bill does not appropriately address transboundary issues in relation to climate change. For example, as outlined above, NIEL believes it would be wise to take advice from the Climate Advisory Council as well as other bodies such as Met Eireann, NGOs, international bodies such as the UN IPCC and third level educational establishments, some of which may be in the Republic of Ireland, when deciding on what actions to take and which policies to set.

Given that there are three international river basins on the island of Ireland, shared marine waters and many habitats and species that are common to both jurisdictions which will need to be managed on an all island basis, it makes sense to take a broader, all island approach to tackling climate change.

The need to work across borders also applies to issues in England, Scotland and Wales with whom NI needs to continue to collaborate.

b) Do you think that there should be a transboundary approach to Climate Change?

Yes. In fact, this is essential.

11. Additional Information

a) Are there any other measures not included in the Bill that you think should be included and why?

Yes.

The just transition is an essential component of any future NI climate change legislation. This point has been made by, amongst others the UK CCC in its 2019 report “Net Zero The UK’s contribution to stopping global warming” (on page 253) where it said that a just transition

“is now widely recognised as a crucial element of a low-carbon transition"
However, there is no provision in the climate change no 2 bill for a just transition. This is a major failing. It is disappointing that the climate change no 2 bill does not see fit to support sustainable jobs and job growth, net-zero carbon investment and infrastructure, create work and reduce inequality, poverty and social deprivation as outlined in the PMB or climate change no 1 bill.

The absence of a provision for a just transition from the climate change no 2 bill also makes the case for all sectors, including the agricultural sector, to support the PMB, otherwise those sectors are unlikely to get the support they will need to make the necessary changes to meet the lower GHG reduction target of at least 82% in the climate change no 2 Bill. Sections of the agricultural community already support the PMB including the Nature Friendly Farming Network and Farmers for Action.

In relation to a just transition, the CCC said on page 12 of its 2019 report “The UK’s contribution to stopping global warming”,

“The transition, including for workers and energy bill payers, must be fair, and perceived to be fair. Government should develop the necessary frameworks to ensure this. An early priority must be to review the plan for funding and the distribution of costs for businesses, households and the Exchequer.”

NIEL believes that NI could and should adopt an approach similar to that taken in Scotland. The Scottish Government established the Scottish Just Transition Commission in 2019 to advise on a net-zero economy that is fair for all. The Scottish principles for a just transition state that action to reduce net greenhouse gas emissions should: support environmentally and socially sustainable jobs; support low-carbon investment and infrastructure; create decent, fair and high-value work in a way which does not negatively affect the current workforce and overall economy and contribute to resource efficient and sustainable economic approaches which help to address inequality and poverty. The Scottish Government also committed funding to a just transition with £100m pledged towards a Green Job Fund, £60m to help industrial and manufacturing sectors decarbonise, £70m for improved refuse collection infrastructure and £150m to deliver a 50% increase in woodland. Similar funds in Northern Ireland should be established to help create opportunities for blue and green infrastructure, sustainable tourism, nature restoration, to mitigate against climate change and help progress other key Executive priorities. NIEL welcomes the Department for Infrastructure’s commitment to £20m for Green and Blue infrastructure in June 2021 and the £2.8m funding for greenways announced on 16th September 2020. These are steps in the right direction, however, more action and longer term planning and funding will be required.

b) Do you have any other comments you would like to make?

The World Meteorological Organisation (WMO) found that the average global temperature in 2020 was about 14.9°C, which is 1.2 (± 0.1)°C above the pre-industrial (1850-1900) level. The UK Met Office also found that the average global temperature for 2020 as a whole was
1.28 (±0.08)°C above pre-industrial levels, taken as the average over the period 1850-1900. The “exceptional heat” of 2020, as the WMO described it\textsuperscript{16}, meant it was one of the three warmest years on record and almost matched the temperatures of the hottest year on record, 2016, despite the cooling La Nina conditions which existed towards the end of 2020 which typically suppress global temperatures.

According to NOAA, the annual global land and ocean temperature has increased at an average rate of 0.08°C per decade since 1880. However, since 1981 the average rate of increase is more than twice that rate at 0.18°C\textsuperscript{17}. On the basis that the WMO and UK Met Office found that the average global temperature in 2020 was on average 1.2 (± 0.1)°C to 1.28 (±0.08)°C above the average, if the post 1980 rate of temperature increase persists, by 2040 global temperatures could be between 1.46°C and 1.72°C above the global average. This is at or beyond the target of the Paris Agreement to ensure global average temperature rise is less than 1.5°C above the pre-industrial average. However, if the 2020 temperature was 1.36°C above the global average, which is the upper limit of the Met Office’s calculations, then with 0.18°C temperature rise per decade, the world would pass the 1.5°C threshold by 2030 (reaching 1.54°C). NIEL contends that it is therefore clear that we must urgently and drastically reduce the levels of greenhouse gases (GHGs) emitted, especially Carbon Dioxide (CO\textsubscript{2}) which is produced by burning fossil fuels and is often described as the primary greenhouse gas as it is responsible for around three quarters of GHG emissions. As the UN Secretary General Antonio Guterres said in the UN ‘State of the Global Climate 2020’ report

“The data in this report show that the global mean temperature for 2020 was around 1.2°C warmer than pre-industrial times, meaning that time is fast running out to meet the goals of the Paris Agreement. We need to do more, and faster, now.”

In terms of what we need to do, we need look no further than the very clear statement of the CCC as stated on page 17 of its 2019 report “Net Zero The UK’s contribution to stopping global warming”

“Within the UK, a 100% all-GHG target sends a clear signal that all greenhouse gases matter and all need to be reduced. No sources of emissions can qualify for special treatment. All emissions from all sectors must be eliminated or offset with removals.”

-ENDS-
1 https://www.ipcc.ch/
2 https://www.ipcc.ch/sr15/chapter/spm/
3 https://twitter.com/BBCNewsNI/status/1286339707526361097
4 http://aims.niassembly.gov.uk/officialreport/report.aspx?&eveDate=2020/02/03&docID=292480
7 file:///C:/Users/44770/Desktop/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf page 239
8 https://www.theccc.org.uk/publication/sixth-carbon-budget/ page 267
9 Ibid page 267
12 https://www.nature.com/articles/s41586-018-0071-9
16 https://public.wmo.int/en/media/press-release/2020-was-one-of-three-warmest-years-record