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CARDIFF UNIVERSITY

PRIFYSGOL CAERDYDD

7 December 2018

Dear Committee on Climate Change,

Please find below the response to your 'zero carbon economy call for evidence' from the **Cardiff University Understanding Risk Group.**

The Cardiff University Understanding Risk Group is an interdisciplinary social sciences (psychology, sociology and technology studies, geography) research unit focusing on the impacts upon individuals and communities, and acceptability to people, of environmental and technological risk within everyday life. We have expertise in: the psychology of climate change; public attitudes towards and acceptability of energy supply systems; sustainable behaviour change and energy demand reduction; social conflicts and siting of large scale energy technologies; risk perception, communication and public engagement.

If you would like any further information about the evidence provided below, or wish to discuss any of the issues raised, please do get in touch.

Our submission of evidence includes input from:

Professor Nick Pidgeon
Professor Wouter Poortinga
Professor Lorraine Whitmarsh
Dr Sarah Becker
Dr Stuart Capstick
Dr Catherine Cherry
Dr Emily Cox
Dr Christina Demski
Dr Chris Groves
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Dr Erin Roberts
Dr Elspeth Spence
Dr Katharine Steentjes
Dr Gareth Thomas
Dr Colin Whittle
Ann Stevenson
Steve Westlake

Yours sincerely,

Understand Risk Group, Cardiff University.

Building a zero-carbon economy – Call for Evidence

Part 1: Climate Science

Question 1 (Climate Science): The IPCC's Fifth Assessment Report and the Special Report on 1.5°C will form an important part of the Committee's assessment of climate risks and global emissions pathways consistent with climate objectives. What further evidence should the Committee consider in this area?

ANSWER:

Question 2 (CO_2 and GHGs): Carbon dioxide and other greenhouse gas gases have different effects and lifetimes in the atmosphere, which may become more important as emissions approach net-zero. In setting a net-zero target, how should the different gases be treated?

ANSWER:

Part 2: International Action

Question 3 (Effort share): What evidence should be considered in assessing the UK's appropriate contribution to global temperature goals? Within this, how should this contribution reflect the UK's broader carbon footprint (i.e. 'consumption' emissions accounting, including emissions embodied in imports to the UK) alongside 'territorial' emissions arising in the UK?

ANSWER:

When setting new targets that reflect the UK's appropriate contribution to the global temperature goal, 'consumption' emissions should be included, as it is total emissions that contribute to climate change, not simply 'territorial' emissions. Including consumption emissions in the UK's targets would better reflect the UK's actual carbon footprint, focus Government attention and simplify public engagement about the challenge ahead.

When emissions embedded in the global supply chains of products and services are taken into account, these constitute the largest proportion of UK households' impact on climate change (Baiocchi et al, 2010). Data produced by the UK Government shows that of the 847 million tonnes of CO_{2eq} emissions attributable to UK households in 2015, 83% (704 million tonnes CO_{2eq}) are due to the embedded energy in the products and services used by UK households. Of this, 420 million tonnes is through increasing reliance on imports, compared to the 142 million tonnes generated from transport and household direct use of energy (DEFRA, 2018). Yet attempts to change and challenge consumption, including via policy and legislation, have to date been largely absent (Capstick et al, 2015) and, arguably, seen as off-limits politically. Recent evidence has shed light on public support for resource efficient strategies, including to reduce embedded emissions; this research shows that key criteria for acceptance of new strategies in relation to consumption include product quality, a strong economy, and impacts on the environment (Cherry et al. 2018, Peake et al., 2018).

The UK public is likely to have little awareness of the distinction between 'territorial' and 'consumption' emissions. In light of Article 12 of the Paris Agreement (below), it is necessary to enhance the public's 'carbon literacy' and engage in a more forthright dialogue in this regard; the public should be consulted with respect to the appropriate level and type of action.

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Article 12 of the Paris Agreement States: "Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement."

It is essential to curtail emissions associated with meat and dairy, yet both public awareness and policy responses to this problem are lacking (Bailey et al, 2014). Emissions from travel remain high, with UK aviation demand projected almost to double by 2050 (DfT, 2017), therefore travel behaviour, especially reducing total number of flights, must also be targeted.

Question 4 (International collaboration): Beyond setting and meeting its own targets, how can the UK best support efforts to cut emissions elsewhere in the world through international collaboration (e.g. emissions trading schemes and other initiatives with partner countries, technology transfer, capacity building, climate finance)? What efforts are effective currently?

ANSWER:

The UK positions itself as a global leader on climate change with some justification in the areas of legislation, technical innovation, energy markets and certain renewables energies (primarily offshore wind). There is also an opportunity for the UK to become a leader in promoting behaviour change. Indeed when historic emissions are taken into account, it can be argued that it has a moral obligation to do so. Discussion of the UK's historical responsibility for climate change is largely absent in the public sphere; acknowledgement of this within behaviour change approaches could increase some people's motivation to make changes in their lives.

The UK public generally support international action on climate change, with 67% supporting participation in the Paris Agreement and 53% supporting sending financial aid to developing countries to help them to prepare for climate change (Steentjes, et al. 2017). Generally, it should be noted that matching the scale of the response to the scale of the problem is an effective communication strategy in the context of climate change; responding to global problems with global responses (Brügger et al. 2015).

In addition, there is the potential for the UK to learn from other countries and cultures with respect to changing behaviour (Whitmarsh et al, 2017) and to contribute in turn to an understanding of social transformation. For instance Sweden has been ranked the EU's leading nation for action on climate change (GermanWatch, 2018); in relation to the challenging areas of consumption, Sweden has also pioneered innovations in the sharing economy (e.g., mobility, tools, toys) (Hult, 2015).

However, decarbonising UK energy supplies and changing society's consumption activities cannot be relied upon to reduce GHG emissions. It is also necessary to address global primary material demand and usage and the manufacture of products and goods. Such action needs to move beyond a focus on the energy efficiency of products in use, in

alignment with the objectives of the EU circular economy package (EC 2015). As supported by research on public views (Cherry et. al, 2018, Peake et al 2018) there is opportunity, and the need, to work collaboratively on establishing product requirements, irrespective of territorial borders, that embed durability, reparability, upgradeability, design for disassembly, information, and ease of reuse and recycling in product manufacture along global supply chains.

The UK could also help to broaden the international focus on 'behaviour change', as this framing has important limitations. The emphasis on individual 'behaviours', which are presumed to derive primarily from a person's attitudes and choices, has restricted the ways in which the relationship between householders' energy use and their daily lives has been conceptualized (Shove, 2010). An exclusive focus on the determinants of individual behaviour is distracting researchers and policy-makers alike from addressing difficult and important challenges concerning the social and economic circumstances which give rise to unsustainable practices (Barr & Prillwitz, 2014); for example, a person's income is one of the strongest predictors of their carbon footprint, and so an argument can be made for a focus on 'behavers' as opposed to 'behaviours' (Galvin, 2013). Certain social and infrastructural factors also lead unavoidably to certain patterns of demand. These may include the ways in which essential services such as food, transport and water are provided, as well as a range of expectations that are placed upon people (Shove, 2010).

Question 5 (Carbon credits): Is an effective global market in carbon credits likely to develop that can support action in developing countries? Subject to these developments, should credit purchase be required/expected/allowed in the UK's long-term targets?

ANSWER:

Part 3: Reducing emissions

Question 6 (Hard-to-reduce sectors): Previous CCC analysis has identified aviation, agriculture and industry as sectors where it will be particularly hard to reduce emissions to close to zero, potentially alongside some hard-to-treat buildings. Through both low-carbon technologies and behaviour change, how can emissions be reduced to close to zero in these sectors? What risks are there that broader technological developments or social trends act to increase emissions that are hard to eliminate?

ANSWER:

To help reduce demand for aviation, extensive subsidies that give it an economic advantage over lower-carbon transport options should be removed, including tax breaks on fuel, low-interest loans and favourable business arrangements (Gossling et al, 2017). A fair price and an honest conversation about the climate impacts of flying are needed, so that people can make better-informed choices. 'Transport taboos' should be broken that

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prevent policy-makers from considering options that are perceived as politically difficult, such as restrictions on flying (Gössling & Cohen, 2014; Marshall, 2014). Such transport taboos are reflected in the absence of references to reducing demand for long-haul flights in Government literature on behaviour change (DEFRA, 2008).

Equity issues around flying should also be considered when looking at new targets. Only 15% of the UK population take 70% of international flights (Barasi & Murray, 2016), while half the population don't fly at all (DfT, 2014). Curiously, the DfT's figures on per-person flights per annum top out at '4 and above', thus failing to capture the far greater number taken by frequent flyers; more detailed data on this should be gathered to inform decision-making.

Given the scale of the climate challenge, the Government should not shy away from measures they anticipate may be unpopular. The idea of green taxes to limit consumption has met with approval from people who fly, provided revenues are put towards tackling climate change (Randles & Mander, 2009). It is important to recognise that the ways in which price 'green' mechanisms and taxes are received by the public are highly contingent on whether these are seen as fair and progressive (PMR, 2018). Contradictory messages that seem to promote consumption while asking individuals to take responsibility for their GHG emissions can result in a loss of trust in government and a rejection of personal responsibility for the climate impacts of aviation (Kroesen, 2013, Hares et al, 2010). The importance of legitimacy and credibility is highlighted by Attari et al. (2016), who found that if messages from experts about the need to reduce personal carbon footprints are to be taken seriously, they themselves must be seen to be taking action.

The public in several countries have expressed frustration at being effectively locked into flying because lower-carbon options, such as trains, are more expensive, less convenient or simply unavailable. Studies reveal frustration that pro-environmental behaviour requires individuals to overcome structural barriers and incur economic penalties (Hall, 2013; Higham et al, 2016).

This indicates that Government needs to take a more joined up approach to its strategies for reducing emissions from hard-to-reach sectors. In our response to Q9, we outline further ways to address these sectors.

ANSWER:

Greenhouse gas removal technologies vary enormously in their requirements and consequences, and globally-speaking a portfolio of options will be needed to offset emissions, because of risks and constraints to each individual GGR technology (Fuss et al., 2018). 'Low regrets' options such as wetland restoration and soil carbon sequestration

should be pursued immediately, as recommended by the CCC (Berg et al, 2017); however, their sequestration potential is limited and they should not be relied upon to offset UK emissions. The UK government should continue to support research into more novel GGRs such as Direct Air Capture, because long innovation lead times mean that significant cost reductions and scaling-up will need to start soon if they are to contribute within a reasonable timeframe. However, evidence is starting to emerge that the promise of GGRs could reduce policy incentives to support conventional mitigation (Markusson et al, 2018). For this reason, the actions we have suggested in the other sections of this consultation response should absolutely take precedence, because of the extremely high risks associated with 'overshooting' emissions targets (Obersteiner et al., 2018) and due to the potential irreversibility of crossing certain thresholds.

Work on public perceptions of GGR is at an early stage. Non-engineered options such as afforestation may be more popular with the public, because of their familiarity and perceived naturalness (Campbell-Arvai et al, 2017; Corner et al, 2013). However, studies suggest that GGR in general may be less well received than conventional mitigation (Bellamy et al, 2016; Corner et al, 2012). Furthermore, proposed co-benefits do not necessarily emerge in-line with the most efficient CO_2 removal; for example, densely-planted evergreen plantations don't tend to provide local benefits for biodiversity, leisure or wellbeing. The UK also needs to ensure that support for GGR research and deployment does not lead to counter-productive outcomes elsewhere, such as the removal of tropical forest sinks to plant biomass.

Many engineered GGRs require carbon storage, which might be highly problematic for the general public (Mabon et al, 2014; Thomas et al, 2018). Evidence from our recent work suggests that government policy on 'fracking' has had a significant impact on attitudes toward CO_2 storage, with people drawing comparisons to the risks of putting pipes underground, earth tremors and leakage, and a perception that expert assurances of safety are not to be trusted. We are currently conducting detailed research on UK publics' attitudes to BECCS, Direct Air Capture and Enhanced Weathering, and expect to have initial results in late 2019.

ANSWER:

The term 'innovation' has been primarily linked to technology advances, but there is also scope for a narrative of 'social innovation' as referenced in the IPCC's latest report 'Global Warming of 1.5C' to reduce emissions beyond the UK's current targets (IPCC, 2018; Mulgan et al., 2007). Social Innovation has the potential to support novel and experimental approaches beyond the narrow 'what works' framing of social change in current Government discourse (Capstick et al., 2015). Such innovations are elaborated further in the answer to Question 9.

ANSWER:

There is significant potential to cost-effectively reduce emissions and achieve other wellbeing benefits through promoting active travel, changes to diet, and consumption reduction (Capstick et al., 2015; Kasser, 2017). Yet behavioural and organisational change has so far attracted attention primarily in relation to waste-reduction behaviours such as recycling. There is a need to go beyond simple consumer 'nudges' to achieve the requisite systemic transformation to deliver the goals of the Paris Agreement (Grubler et al., 2018).

In particular, material consumption, diet, mobility, and thermal comfort offer significant potential for mitigating climate change while providing other co-benefits, but have proven resistant to change, and have not received the policy and research attention warranted (Capstick et al., 2015; EEA, 2005). For example, shifting from current average diets to plant-based diets could cut GHG emissions from food in half or more, as well as improving physical health and biodiversity (Aleksandrowicz et al., 2018).

Low-carbon mobility options, such as active and shared travel, provide health, social and financial benefits that are more likely to motivate behaviour and policy change (Graham & White, 2016; Whitmarsh, 2009), and in turn trigger new political alliances supporting faster decarbonisation (Betsill, 2001). Aligning environmental and social with economic objectives is critical for innovative industry-level change (Tregaskis & Almond, 2017).

A US study suggests that 20% of direct household emissions could be reduced in a 10-year period under a 'reasonably achievable emissions reduction' (RAER) framework, equating to 7.4% of US emissions (Dietz et al., 2009); this analysis furthermore does not encompass many areas of life, such as diet or consumption. A similar conclusion was reached by UKERC in 2009, although there is a clear case for an updated, more wide-ranging UK assessment (UKERC, 2009). More ambitious and imaginative social innovations are necessary, given that social marketing and 'nudge' approaches are unlikely to be sufficient for widespread behaviour change (Corner & Randall, 2011) particularly where these entail active, considered engagement in changes by people themselves.

Consistent with the 'every big helps' logic of David MacKay (MacKay, 2008), the most significant areas of emission reduction should be highlighted by Government; indeed, the focus of policy should be determined in large part by the corresponding carbon emissions of particular behaviours and practices; to date, this consideration has been largely overlooked. Wynes & Nicholas (2017) calculate these to be: having fewer children, living car-free, avoiding plane travel and eating a plant-based diet (Wynes & Nicholas, 2017).

Crucially, UK policy lacks a consistent, visible, or compelling narrative on climate change; politically, and as a society, the UK is a long way from a meaningful and comprehensive engagement with the public at large. The large majority of the UK public recognises the reality and human causation of climate change, and expresses concern and a sense of personal obligation to act (Steentjes, et al. 2017). However, a wider conversation with the public about the scale and rapidity of transformation required is necessary; it will not be possible to move further with emissions reduction without this. Recent research finds that UK policy-makers do not, however, consider engaging the public to be a priority. Drawing on interviews with UK politicians, policy-makers, and others involved with formal action on climate change, (Shaw et al, 2018) report that there is 'zero public visibility' for climate

Question 9 (Behaviour change): How far can people's behaviours and decisions change over time in a way that will reduce emissions, within a supportive policy environment and sustained global effort to tackle climate change?

initiatives, that there is 'no pubic facing narrative' and that as a society we are 'failing to communicate the need for radical action' on climate change. Willis (2018) likewise finds that climate change is very rarely talked about by UK MPs with their constituents, and that as a mainstream political issue it has faded from view (Willis, 2018).

Behaviour change on the scale required is not possible without clear leadership, a vastly improved communications infrastructure and commitment to wider public engagement, as well as exemplary behaviour and consistent messaging from Government, business and civil society. Indeed leading by example is cited by the CCC (2008) and DEFRA (2008) as one of the necessary conditions for behaviour change. Government policies which promote fossil fuel use, such as fracking, airport expansion, large-scale programmes of road-building, and cutting of solar feed-in-tariffs, seriously undermine the credibility of environmental policies and behaviour-change objectives.

Question 10 (Policy): Including the role for government policy, how can the required changes be delivered to meet a net-zero target (or tightened 2050 targets) in the UK?

ANSWER:

Part 4: Costs, risks and opportunities

Question 11 (Costs, risks and opportunities): How would the costs, risks and economic opportunities associated with cutting emissions change should tighter UK targets be set, especially where these are set at the limits of known technological achievability?

ANSWER:

Question 12 (Avoided climate costs): What evidence is there of differences in climate impacts in the UK from holding the increase in global average temperature to well below 2°C or to 1.5°C?

ANSWER:

Part 5: Devolved Administrations

Question 13 (Devolved Administrations): What differences in circumstances between England, Wales, Scotland and Northern Ireland should be reflected in the Committee's advice on long-term targets for the Devolved Administrations?

ANSWER:

Part 6: CCC Work Plan

Question 14 (Work plan): The areas of evidence the Committee intend to cover are included in the 'Background' section. Are there any other important aspects that should be covered in the Committee's work plan?

ANSWER:

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