House of Commons

Science and Technology Committee

Communicating climate science

Eighth Report of Session 2013–14

Additional written evidence

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Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science and associated public bodies.

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The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via www.parliament.uk

Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at http://www.parliament.uk/science. A list of reports from the Committee in this Parliament is included at the back of this volume.

The Reports of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in printed volume(s). Additional written evidence may be published on the internet only.

Committee staff

The current staff of the Committee are: Dr Stephen McGinness (Clerk); Leoni Kurt (Second Clerk); Victoria Charlton (Committee Specialist); Dr Elena Ares (Committee Specialist); Dr Elizabeth Rough (Committee Specialist); Darren Hackett (Senior Committee Assistant); Julie Storey (Committee Assistant); and Nick Davies (Media Officer).

Contacts

All correspondence should be addressed to the Clerk of the Science and Technology Committee, Committee Office, 14 Tothill Street, London SW1H 9NB. The telephone number for general inquiries is: 020 7219 2793; the Committee's e-mail address is: scitechcom@parliament.uk.

List of additional written evidence

Written evidence

Written evidence submitted by Adrian Camp (CLC001)

Member of the Oxford Climate Sceptics Group, an informal grouping of scientists, graduates and lay people with an interest in climate science and policy.

The questions before the committee are ill-posed. They assume things not in evidence and they presume a desired outcome which is not supported by the facts, such as they are.

The general public is not very interested in climate change. Their interest is decreasing and there is nothing to be done to stop it. The weather is not co-operating and absent any vestige of warmth in summer or winter it is very difficult to see how any evidence will convince anybody. It is not in the interest or the remit of the committee to be telling the public what to think.

The evidence for climate change at all is thin. The evidence for climate change outside of the known range of natural variation is non-existent. Paleoclimatology tells us that the climate has been far warmer and far colder than the present at various times in the (geologically) recent past. There is no evidence that any observed warming is attributable to human activity. Those who claim to produce such evidence are heroic in their assumptions, especially those who base this claim on climate modelling. I or many better-qualified others can explain this in detail if required, it will not fit here.

If all the alarmist claims were true, there would be nothing that we in the UK could do about it. Our actions are lacking in global influence in CO2 terms and indeed in political terms. Nobody is going to stop the Chinese from burning coal. But we here have decided to cut our economic throats voluntarily to prevent a non-existent disaster while being well aware that our actions are the merest token.

When one reads the actual science, the various reports of the IPCC et al (NOT the executive summaries), one is struck by the level of doubt. Doubt is quite common in science, it is part of a process which can take a long time to resolve. Doubt is not welcomed by policy-makers. But doubt is what there is. No sure level of understanding of natural processes, no ability to predict the effects of a change. There is not enough certainty, in real life, to support a series of measures which are costing us our economy and will lead to power cuts in a matter of months if not reversed (Yes, that is another committee and not your purview, but I think it matters..)

The committee is wrong to want to convince the public of anything. It is wrong to assume that the problem with climate is lack of communication. What it ought to do is return to the evidence and examine it with a far more critical eye, and invite scientists from both sides to testify. There is still time to avoid a self-imposed disaster.

Executive Summary

It isn't getting warmer and there are no unprecedented weather events in wind, drought or flood. It is time to revisit the whole thing just in case it is wrong.

April 2013

Written evidence submitted by Mr Ron Hughes (CLC002)

A Summary of my Main Points

1. Climate always has been changeable, since time immemorial.

2. The "Problem" keeps changing, after each set of models is proven to be inaccurate. Firstly it was "Global Warming". Then it was Catastrophic Anthropogenic Global Warming. Then it was "Climate Change".

3. The once-credible BBC has descended into a propaganda-dissemination organisation that no longer provides balanced reporting of climate issues. [So called "28 Gate" affair—the BBC's refusal to name the "scientific experts" who convinced the broadcaster to take a firmly warmist position when reporting climate change.]

A Brief Introduction

4. I am a recently-retired Sales Engineer with 45 years' experience of designing and selling energy-efficient space heating systems for Industrial & Commercial buildings. (Factories, Warehouses, Retail-sheds, Sports Halls etc)

5. Having been in the energy industry all my working life, I have a reasonable understanding of users' needs, and, some of the "hype" surrounding certain systems and developments.

6. I firmly believe The Royal Society's motto "Nullius in verba" which roughly translates as "take nobody's word for it". This encourages people to withstand the "domination of authority" and to seek verification of all statements by an appeal to facts determined by experiment.

7. I strongly believed the "scientific consensus" that Anthropological Global Warming was a "problem" until the Climategate e-mails were released into the public domain in November 2009.

8. I do not, and have never, belonged to any political party.

9. I am not a qualified scientist, nor have I any connection with research organisations. I am simply a concerned member of the public who objects to paying unnecessarily-inflated prices for fuel & energy.

Factual Information I would like the Committee to be Aware Of

10. For this Committee to understand public understanding of "Climate Change", perhaps it could define "Climate Change". And, state whether that definition is the 2013 definition, the 2010 definition or some previous definition. And by which particular organisation. Therein lies your problem. "Solutions" are proffered by all & sundry, but there's no universal agreement as to what the problem might be, or, even if there is a problem at all. Engineers have a dictum: If it ain't bust, don't "fix" it.

11. This Committee's Terms of Reference is an example of what some people might suggest is a flawed exercise. It states "Foresight cautions that "should scepticism continue to increase, democratic governments are likely to find it harder to convince voters to support costly environmental policies aimed at mitigation of, or adaptation to, climate change." " This means it proceeds from the *prior-assumption* that CAGW is happening *and* detrimental to life. Maybe resources would be better employed by firstly scrutinising the *quality* of the "climate" science UK Taxpayers have already paid for.

12. It is only in the past few decades that there have been widespread, 3-dimensional, deployment of very-accurate scientific measuring instruments. All estimates of historic data are based upon "theoretical models' or phenomena based upon proxy. Those Models and Proxy are susceptible to selective manipulation, particularly where their full details are not disclosed to enable replication by other scientists.

13. The Climategate emails revealed to the public that previously-renowned scientists would be prepared to manipulate their data and declared-results to achieve a pre-desired result. Examples are:- Phil Jones (CRU/ UEA Norwich) "Hide-the-Decline" email 0942777075 dated 16 November 1999. And, the attempt at redefining what were already historic (climatic) events the Little Ice Age and Medieval Warm Period simply because their data model couldn't account for them, email 1047474776 dated 11 March 2003 refers. Relevant excerpts quoted below.

14. Companies in the Energy and Climate Change market are allowed to pay thousands of pounds a year to certain influential members of the Energy and Climate Change Select Committee. This destroys that committee's credibility.

15. Politicians in the UK (and worldwide) were misled by certain scientists who wrongly predicted that rising CO2 emissions would lead to CAGW (Catastrophic Anthropogenic Global Warming). As a result the Kyoto Agreement was signed. However, CO2 is the world's best plant food, and is only a Trace Gas. It comprises just 394.45 ppmv (0.039445%) of the atmosphere. Our Met Office confirms that over the past 15 or so years, despite worldwide CO2 emissions having increased year-on-year, there has been no statistically-significant rise in global temperature.

16. Massive subsidies have to be paid (by all electricity consumers) to wind turbine and solar pv cell owners, which don't actually save any CO2, because the power those sources produce are both intermittent and unpredictable, so less-efficient-but-more-responsive conventional power stations have to remain on standby.

17. "Scientists" seeking for grants (ie for their livelihood) insert the emotive phrase "Global Warming/ Climate Change" in their application to improve their chance of success. [Robert Gordon University, Aberdeen applied for a grant to research a "link" between obesity & greenhouse gas (CO2) emissions. However, they chose to ignore one simple, well-known fact that destroyed their hypothesis: That because obese people have a shorter, less-energetic life-expectancy, their lifetime CO2 exhalation is less than that of a "normal" person; and, significantly less that that of a fitness-fanatic who spends hours/day doing strenuous exercise.]

18. The BBC's Charter dictates that it be impartial, yet it spent a 6-figure sum trying to prevent Licence-Payers from knowing who it wined and dined to determine its strategy in promoting so-called Climate Change. It misled the nation by initially inferring that the 28 were "experts", when very few had Climate-related qualifications, and even fewer would be deemed "expert" by qualified Climate Scientists.

Extract from email 0942777075 dated 16 November 1999

Phil Jones to Michael Mann, and others, regarding a diagram for a World Meteorological Organization

"I've just completed Mike's Nature trick of adding in the real temperatures to each series for the last 20 years (ie from 1981 onwards) and from 1961 for Keith's to *hide the decline."* [My emphasis added]

Extract from email 1047474776 dated March 11, 2003

Phil Jones replies to Michael Mann: "Can we not address the misconceptions by finally coming up with definitive dates for the Little Ice Age and Medieval Warm Period and redefining what we think the terms really

mean? With all of us and more on the paper, it should carry a lot of weight. In a way we will be setting the agenda for what should be being done over the next few years."

April 2013

Written evidence submitted by Gillespie Robertson (CLC003)

1. *Current state of public understanding (and recent changes in that state)*: educated adults used to understand the words "climate change" as meaning observable and measurable movements in the ever-changing global and regional climate over all time-scales in the history of planet earth and of human civilisation, and also as experienced by any observant individual throughout his or her lifetime . Over the last one or two decades, educated people have been surprised and disappointed to see and hear these words used almost exclusively, both by many ill-informed politicians and by alarmist doomsayers, as if they meant "catastrophic *anthropogenic* global warming (CAGW.) "My own understanding has improved immeasurably from nearly five years of careful and detailed reading on all sides mostly of the scientific, but also of the political, arguments. Above all I have come to understand how the modesty of early climate scientist-historians such as Hubert Lamb has given way to the arrogance of those who pretend that mankind's knowledge of the different factors which drive the earth's climate is anything other than minimal, primitive, and thus incidentally grossly inadequate in terms of supporting any related Governmental policy initiatives other than a need to carry out fundamental research on ALL climate drivers.

2. *Trusted voices* : those very few who concentrate on measurable and observed climate data and who use moderate and temperate language, rather than those who rely on unproven and falsifiable hypotheses, publicise computer-modelled scenarios, issue public doomsday predictions, and/or make highly personal attacks on those who disagree with them.

3. *Role of Government* : it was the Nazi propagandist Dr. Goebbels, of eternal infamy, who said "It is the absolute right of the State to supervise the formation of public opinion." All decent people should and most do recoil in horror from the direction in which this sort of thinking leads. The lamentable track record to date of U.K. Government Departments , "scientific advisers" and "publicly funded scientists" in largely supporting a highly dubious and often scientifically illiterate alarmist "climate change" message to the public underscores the view that Governments and their advisers should lean over backwards to avoid ALL propaganda in respect of "climate science."

4. *Improving public understanding* : your questionnaire is fundamentally flawed. It starts from a number of wrong premises —you appear to proceed from the assumption that CAGW (see above) is true, deadly and happening now. This leads to the second assumption : that rising scepticism must be because people are ignorant or ill-informed. The third —and typically totalitarian —assumption then follows, namely that what is needed is re-education. *Barriers to understanding* : the main one is a lack of knowledge. The answer is personal effort to obtain, study and interpret data, not to read Government propaganda. *The media's role* : this is already, and is more likely than not to continue to be, largely negative in terms of working against the public interest which Government is supposed to serve : bad news sells, and alarmist climate propaganda is "bad news." The worst possible scenario is of a Government-controlled media. To quote the appalling Dr. Goebbels again, "Think of the Press as a great keyboard on which the Government can play."

5. *Public understanding and policy formation*: one can only hope that the public will increasingly recognise the folly of its Government behaving like King Canute of legend. The arrogance and folly of humans pretending to have a "climate change policy" at all, let alone an effective one, is beyond belief ; and if one looks at the entire global picture, the arrogance and folly of the U.K. Government in particular is unparalleled.

6. *Public attitudes and energy policy* : there is much evidence that most politicians are still unaware of the extent to which the educated public is waking up to the folly of recent and current U.K energy policy, based as it is on promoting and subsidising the least efficient, least reliable and highest cost forms of electricity generation on the basis of "climate science" and in the name of "saving the planet from dangerous climate change." One must fervently hope that our political class will very soon wake up to the scientific realities and to the extremely damaging economic and social consequences of recent energy policies and initiatives.

7. *Government expertise in social and behavioural sciences* : your question is confused, but has unpleasant Orwellian undertones of totalitarian thinking.

8. *Can lessons be learned from other countries* ? Global evidence points to increasing public disaffection with and (with the exception of small but very well-funded pressure groups) disengagement from Governmental focus on "climate change policy" as a major societal concern. It seems probable that Governments which continue with such a focus will eventually lose public support for their entire political platforms, simply because of the severe economic and even environmental damage which some of those policies are increasingly wreaking.

April 2013

Written evidence submitted by Philip Foster (CLC005)

The question that the subject of your enquiry boils down to is this.

> *"Why is it that "ordinary" people are increasingly doubting the carefully constructed and well orchestrated panoply of lies we have been telling them?"*

The Answer:

In many cases we just might know more science than you do, and secondly not be quite as gullible as many of you seem to be.

The "science", as you people are so keen on assuring us, is "settled". Indeed it is settled—in favour of the null hypothesis. There is no dangerous "climate change" caused by human activity, increasing C02 does not present a threat, rather a benefit—more crops and therefore more food to feed a growing population.

The economics of "green" energy are the economics of the madhouse.

The old adage "the truth is an oft repeated lie" for once has proved as untrue as the government paid climate scientists' predictions. They would be wise to heed these words in the *Torah:*

> *You may say to yourselves, "How can we know when a message has not been spoken by the LORD?" If what a prophet proclaims in the name of the LORD does not take place or come true, that is a message the LORD has not spoken. That prophet has spoken presumptuously. Do not be afraid of him.*

Deuteronomy 18:21–22

April 2013

Written evidence submitted by Dr Phillip Bratby (CLC006)

I have a first class honours degree in physics from Imperial College and a PhD in physics from Sheffield University. I am retired and have no interests to declare. My interest is that of a physicist with vast experience of complex systems involving heat transfer, fluid flow and thermo-dynamics (of which the climate system is an example) and computer modelling of such complex systems.

My evidence is based on a lifetime experience of working in the real world of engineering, which relies on hard evidence. My evidence thus calls into question the vague and unsubstantiated hypotheses of those who call themselves "climate scientists" and the poor state of the evidence on which they appear to rely for their forecasts.

A rational person would have thought that, after 16+ years (16 to 23 years, dependent on which metric is chosen) of no global warming, some doubt and questioning of the flawed hypothesis of the "atmospheric greenhouse effect", might have crept into the consciousness of the members of the committee.

What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?

1 There is no definition of "climate change" as used by the Government, the media and all official bodies, so how can the public be expected to understand "*what is meant by climate change*"? It seems that there has been a deliberate policy to confuse the public into thinking that the climate didn't change until recently. The problem is that the climate has always changed and always will. Mankind has always had to adapt to living with a changing climate, be it an ice age or benign warm conditions. So the Government declaring that "climate change is the biggest problem" we face is pure nonsense. The public is quite reasonably getting fed up of all the propaganda about climate change, which is not borne out by their everyday experience. If the Government sees the problem as "man-made global warming", it should say so and stop using the term "climate change", which is meaningless.

2 Any unusual weather event is now widely blamed by politicians and the media as caused by "climate change". The public includes people who have a longer memory than politicians and know that there is nothing new under the sun. If severe weather has existed in the past and was not then caused by "climate change", then the public's understanding is only going to become more sceptical, as it has, of all the propaganda. One minute the public is told we are in a drought due to "climate change"—a few months later we are suffering floods and we are told this is due to "climate change". Then heat waves are due to "climate change" and then severe winters are due to "climate change". No wonder the public distrusts politicians.

3 If the Government wants the public to understand what is meant by the mythical "atmospheric greenhouse effect" then it should provide an explanation based on physics—noting that the atmosphere does not behave like a greenhouse. There is no basis in physics for the "atmospheric greenhouse effect", it was something dreamt up by "climate scientists" who don't seem to have an understanding of the laws of physics—for them to say that a gas such as carbon dioxide "traps heat" is just laughable and shows their ignorance.

Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?

3 The public quite rightly distrusts organisations such as the BBC, which blame every weather event on "climate change" and introduce "climate change" in virtually every programme they produce. Politicians are, quite understandably because of all the recent scandals, trusted by very few members of the public. Scientific and engineering institutions are not trusted because of their perception as Government propagandists being funded by Government (he who pays the piper calls the tune). Most members of the public who have an interest in "climate change" get their information from widely trusted internet websites and a few independent media correspondents who do not have vested interests and tell the truth about how the political obsession with "climate change" is damaging the economy, ruining peoples' lives and leading to an acute problem with regard to our future energy supplies.

How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?

3 It would help if "climate change", "man-made global warming" and all the other phrases such as "climate disruption" "catastrophic climate change" etc were not used as if they have some defined meaning. A simple definition of the problem should be provided and the terminology should then be exclusively used. Labelling anybody who disagrees with Government propaganda as a "climate change denier" or even "climate denier" (who would deny that the climate changes or that there is climate?) does not help public understanding. The media should tell the truth; that would make a positive change.

How important is public understanding in developing effective climate change policy?

4 There will always be public resistance to "climate change" policy as long as the public are not convinced that "climate change" is a problem and as long as they see that a few are hugely benefiting from "climate change" policy, whilst the vast majority of the public see themselves and the economy getting ever poorer. The cure is seen to be far worse than the disease. A bit of honesty about the fact that Government-funded "climate scientists" don't have a clue about what the future climate will be, because the computer models on which they rely are based on false physics, would help public understanding. It has to be remembered that the IPPC has said "*In climate research and modelling, we should recognise that we are dealing with a coupled non-linear chaotic system, and therefore that the long-term prediction of future climate states is not possible*". The public is aware that all long term forecasts are wrong and no amount of propaganda will change this fact.

What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?

5 The fact is that anybody who understands "climate change" can see that the energy policy measures and initiatives put in place to tackle the supposed problem are counter-productive and are slowly ruining the country. The fact that energy policies have been virtually non-existent for 16 years and that all policy measures that have been put in place increase energy costs, increase fuel poverty, enrich a few with vested interests and damage the countryside, all in the name of "tackling climate change", cannot be helpful.

Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?

6 Until the Government continues to have this religious, non-scientific belief in "climate change" (aka man-made global warming), against all the scientific evidence to the contrary, then no amount of propaganda and brain-washing will affect public understanding. The public are not fools and can see through the "climate change" scam. Continual propaganda from Prime Ministers and other Ministers that "the science is settled" and "we have X days to save the planet" are not believed by the public, who are not as stupid as politicians think. Statements like "snow is going to be a thing of the past; children aren't going to know what snow is" just add to the public rejection of the propaganda. Social and behavioural "sciences" are quite rightly seen by the public as just more nonsense; using the advice of such people for more propaganda purposes will be counter-productive.

Can lessons about public engagement with climate change policy be learned from other countries?

7 Those countries that put the interests of their citizens and their economy ahead of the attempts to "tackle climate change" should be emulated by the UK Government. The public knows that a "low carbon" economy is a third world economy. The public knows that copious cheap energy provides wealth and the wealth can be used to adapt to whatever form the future climate happens to take—whether it's warmer and more benign or colder and harsher (as in the Little Ice Age).

April 2013

Written evidence submitted by Ralph Morris (CLC008)

I will start by questioning the implication in the URL entitled "Climate: Public understanding and policy implications". Reading that piece I am steered towards the perception that government policies have been informed by the opinions of all scientists world-wide and that these opinions are based on evidence.

As I write this paper I am listening to BBC News reporting that scientists are predicting a 200 year Ice Age as a result of (human activity induced) climate change. About a decade ago, the same news programmes were reporting that scientists were predicting the end to snow in winter in the UK as a result ……!

Recently the revered, but frequently inaccurate, David Attenborough was promulgating all sorts of doom—and quoting false figures, for which he had to apologise.

I read reports which both prove and refute Climate Change, both groups written with scant regard to the truth. And the truth is, I don't know what the truth is! I do know that some of the "facts" are so obviously the product of a fertile imagination that everything else is open to question.

Common sense tells me that the Earth is constantly cycling between warm periods and cold periods, without any help from humankind. It is currently going through another of its cycles, this time assisted by human intervention. Whether the annual impact of humankind's intervention equates to just a single volcanic eruption is open to question.

To conclude that the human impact is sufficiently serious to merit the hysteria which pervades the corridors of power requires a major effort to ignore what facts there are. The only conclusion which I can reach is that Climate Change is being used as yet another pawn in the power game: and to hell with the population of the UK!

If, for one fantasy moment, I accept the postulate that human intervention is significantly influencing the climate, the UKs contribution is minimal when compared with that of the US or China. Whichever way I view it, I cannot see any rational argument for most of the "low carbon" policies which are being preached by the High Priests of this new UK religion. However, it still makes good sense to reduce our dependence on fossil fuel sources, if only on the basis that a dwindling resource is best reserved for uses where there is no alternative.

Those who claim that what are commonly known as "renewables" will replace fossil fuels are "pissing in the wind"

… which is a particularly apposite epithet, given that so much of the this new Koran or Bible is devoted to wind energy.

Everybody knows that wind power is unreliable and must be backed up by an alternative power source.

Everybody knows that if this alternative source is nuclear, it will produce a stable supply at a relatively fixed level for decades. Turning it off to allow wind power to operate merely adds to costs. Either way, wind power subsidies are producing zero benefit to UK Ltd. There is sufficient anecdotal evidence to suggest that corruption is also playing its part in political circles—unless somebody can tell me how else Energy Department (DECC) ministers (and/or ex-ministers) acting as consultants to the "renewables" companies can be construed.

Of course, nuclear engineering companies are now demanding large subsidies to build in the UK. Of course they are! They have seen the offer of subsidies to wind power companies and can see no reason why they should not be offered the same terms. Better terms perhaps, since they will be providing a reliable source of power.

Conclusions

I have to reach the conclusion that the decision-makers are being led by the nose down a series of hugely expensive cul-de-sacs by a group of self-serving pundits, many of whom are enjoying "consultant" status to the "renewable" companies.

This leads me to the inevitable conclusion that a lot of politicians are essentially uninformed, incompetent and wholly untrustworthy and that the whole climate change thing is a scam.

Which does not mean that climate change is not happening—only that it is being used by the unscrupulous to offer "Snake Oil" cures.

April 2013

Written evidence submitted by Christopher Shaw (CLC009)

1. Summary Question

This submission addresses the questions of how public understanding of climate change can be improved and the role of the media in this processes. I provide evidence in support of my claim that the news media have failed to communicate the uncertainties in our knowledge of future climate change impacts. I outline why this failure matters to public understanding of climate change. I offer a suggestion for how to overcome the problems identified through a cost-effective online consultative process which allows citizens to share their ideas on how to respond to climate change in light of these uncertainties.

2. Biography

I am a Visiting Fellow for Science, Technology and Policy Research, University of Sussex. I completed my doctorate as a mature student in 2011 and since that time have been researching various elements of low carbon innovation, public engagement and participatory research.

3. Factual information

The public cannot properly evaluate climate risks without information about the uncertainties surrounding projections of future climate change impacts. In my forthcoming paper *Choosing a dangerous limit for climate change: public representations of the decision making process* I have shown that:[1]

i. The UK news media largely ignore discussion of the uncertainties surrounding our knowledge of when climate change impacts will become dangerous.

ii. When such discussions do occur, the uncertainties are ignored in favour of an unexamined repetition of the "two degrees is a dangerous limit" idea.

iii. To illustrate this sidelining of the "how much is too much climate change" in 2000 my search identified over 1,000 mentions of "global warming" and ten mentions of the two degree dangerous limit. This disparity is common across the 2000–11 timescales examined.

iv. Where mention of the two degree limit is made the idea is justified through reference to a disembodied "science" or to institutions and actors with low levels of public trust.

4. Recommendations

It is well established that simply communicating more science to the public will not change attitudes. A participatory process which allows the public to engage on their own terms with the debate about how much warming, and thus climate risk, is acceptable is an essential element of any attempt to build strong and positive engagement with climate policy and climate science.

I am currently applying to funding councils for support for a research project which will address this need through a repurposing of the Department of Energy And Climate Change's *2050 Pathways Calculator*. Whilst the calculator currently limits participants to choosing different technical routes to a pre-determined end, my version will allow users to investigate how that end was arrived at. The calculator will offer users the opportunity to marry lifestyle choices with potential warming levels and associated impacts. These outcomes from the lifestyle choices made will be presented in a manner that shows in an accessible way the uncertainty ranges associated with those outcomes.

The goal is not to arrive at an agreement of a new dangerous limit but to allow the public to better understand the uncertainties, compromises and conflicts involved in trying to define how much warming is too much. The intended goal from this process is to:

i. Demonstrate to users that uncertainty more powerfully supports urgent responses rather than a business as usual approach while we await full certainty.

ii Show to users that full certainty will probably never be achieved, and the necessity of acting with precaution under conditions of uncertainty.

ii. To provide policy makers, scientists and communicators with data about the choices the public are making under conditions of uncertainty and their reasons for making these choices. This will provide upstream users with important information to be used in crafting more effective communication strategies.

April 2013

[1] http://dx.doi.org/10.1016/j.gloenvcha.2012.12.012

Written evidence submitted by The Scientific Alliance (CLC011)

Summary

1. It is implicit in this consultation that "climate change" is synonymous with "dangerous anthropogenic climate change" and that the public has to be persuaded that stringent emissions-reduction policies are essential. We prefer to think that lay people should be as well informed as possible on such an important issue and then draw their own conclusions as to the need for particular policies. We find it unacceptable for Government to promote a partial and biased view of this issue to support costly renewable energy policies which do not achieve their purported aim.

The Scientific Alliance

2. The Scientific Alliance is a membership-based organisation which encourages open, science-based debate and evidence-based policymaking on environmental issues.

Response to Specific Questions

— *What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?*

3. Most members of the public accept the general principle that climate is changing and that humans have some role in that. However, few are sufficiently interested to want to understand the details or the arguments. Since the 1990s, what was originally labelled "global warming" has instead come to be known as "climate change". There is regular reporting of factors such as Arctic sea ice loss, glacial retreat, sea level rise and extreme weather events. Sometimes they are directly linked to "greenhouse gas" emissions and in many cases projections are made as to what might lie in wait for future generations. In other cases, the stories do not explicitly mention the drivers but the assumption made by readers or viewers is that such changes are anthropogenic.

4. At the same time, the lack of any trend towards higher global surface temperatures since 1998 and the failure of UK summers and winters to conform to the modelled projections made two decades or more ago have made many people rather cynical about the whole issue. There is a sense of passive acceptance of the message rather than much outright engagement. There is also increasing concern about many aspects of renewable energy policy, particularly the rising threat of supply insecurity and the higher costs involved.

— *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

5. People today are less trusting of authority figures than previously. They continue to trust in scientists per se (although the IPCC has not been helpful in the way it has presented its work), but less so than when they work for the government. Energy companies have little public sympathy, based on consumers' experience of rising bills and a failure to put them on the lowest tariffs. The pronouncements of the Met Office are received with a degree of amused cynicism (partly because of the poor record of medium term forecasting, which has tended to cast a more general negative halo over this source). Media reports of scientific work are partially absorbed rather than being actively read or listened to but, overall, readers tend to approve of messages which conform to their own existing prejudices. Hence, readers of the Guardian may read articles which reinforce their existing beliefs, while Telegraph readers may receive and approve of quite different messages.

6. We would characterise the majority of the population as passive accepters of the mainstream message, who do not see climate change as something which is particularly relevant to them. However, their critical faculties are alert to messages which are over-hyped for effect. Messages from government departments and government-funded scientists are unlikely to be received any better than others and will attract the normal degree of scepticism associated with any official pronouncements.

— *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Do the media have a positive role to play?*

7. Implicit in this question is the assumption that the public should subscribe to the view that climate change is largely anthropogenic, will have far-reaching effects and must be tackled now. We believe this is not a self-evident truth and that society would be better served by ensuring that government funding of climate studies is based on a desire to improve our understanding rather than reinforce existing views, that the results are communicated transparently and that full disclosure is made of sources, data and methods. This may weaken the case for the present policy of stringent cuts in carbon dioxide emissions, but we believe that policy should flow from a strong evidence base rather than being constructed and then supported by cherry picking evidence which conforms to it.

8. The main barriers to public understanding of climate change are twofold: a low level of scientific literacy and a general lack of interest in such a long-term issue. This is not to say that those involved do not have a responsibility to put the facts across as clearly as possible, but these barriers are not easily overcome. A minority of people are already committed to the need to take action, others are clearly not in favour, but the majority of the population remains passively accepting up to the point at which the policies begin to impinge

negatively on their own lives. There is little which can be done to change this. In particular, focussing on issues which either make an attempt to be personally relevant or are emotionally charged are as likely to create antagonism as to win people over. It is already clear from population studies that the supposed threat to polar bears has been much overstated, if it exists at all, and using the emotional blackmail of our responsibility to future generations is likely to turn off as many people as it persuades. Messages should be based on observed facts, balances of probability and most likely outcomes, rather than worst case scenarios.

9. The media certainly have an important role to play, but the implication of "positive" is that they should give a consistent message. However, even in a post-Leveson world, this is not the role of a free press. Journalists and editors will continue to look for stories which chime with the beliefs and values of their core readership and report them in their own style. Broadcast media will reach a broader cross-section, but it is not their role to be used as channels for officially-sanctioned messages and it is to be hoped that their reporting is as objective as reasonably possible.

— *How important is public understanding in developing effective climate change policy?*

10. In a democratic society, there has to be a good degree of public acceptance of policies for them to continue. The assumption behind this question is that, if people understood climate change in the way that the scientific and political establishment does, they would be fully behind the drive for emissions reduction. This is a somewhat naive assumption, since most people are far more concerned about the direct effects of policy on them personally than on the reasons which underlie it (unless they are real and present). Although governments are elected to lead, they cannot go too far ahead of public opinion if they are to survive. Any attempt to increase public support for emissions control by presenting the picture of climate change in a misleadingly one-sided way would be to betray the trust of the electorate.

— *What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?*

11. While hard evidence is difficult to come by, it seems clear that people who are fully convinced of the IPCC view of climate change (that the modest forcing effect of increased carbon dioxide is reinforced by positive feedbacks, leading to a significantly greater heating effect) are also supporters of measures which reduce energy use and replace fossil fuels by a range of renewable technologies. We should not forget that there is also a very significant philosophical, moral and ethical component to this view. However, given the failure of a decade or two of intense publicity on climate change to convince more than a minority of people of this need, further communication is unlikely to make much difference. On the other hand, nuisance from a nearby wind farm, or the threat of one being built in the neighbourhood, is enough to make many people reject conventional views of climate change, together with all emissions reduction policies, whatever their merit.

12. It seems to us that the majority of the public remain ambivalent, unconvinced or apathetic. Communication or education will do little to change this. However, the growing concern about energy prices and opposition to new wind farms gives a clear picture of what is likely to happen if the provisions of the Climate Change Act continue to be followed. While support for the policy will continue to be restricted to a minority of people who are convinced of the scientific (and moral) case, opposition will grow to the point at which it becomes a significant electoral issue. This trend will, of course, be reinforced as the public increasingly becomes aware of the futility of adopting costly, marginally effective policies locally when global emissions continue to rise, driven by the rapid development of China, India and other emerging economies.

— *Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?*

13. We are not qualified to answer this question in the way it is formulated. However, the underlying assumption that if people could only be persuaded of the case they would willingly embrace renewable energy policy looks uncomfortably like a proposal for a propaganda campaign. The feasibility of introducing and sustaining policies is of course related to public acceptance, but this question also fails to address the vital issue of policy effectiveness. Current UK policy may be making modest reductions in carbon dioxide emissions in this country, but it is signally failing to reduce the upward trend in global emissions, which is the most relevant measure of success.

14. On a related issue, we question the ability of the Civil Service to provide sufficient expertise for a sound, objective assessment of the various technical messages received by Government. It should not be presumed that the climate system is now well understood. While accepting that politicians deem it right to take what they consider to be the best available scientific advice, this can have serious consequences if not subjected to critical scrutiny. Inevitably, consultation responses often come from vested interests and will therefore be biased, whatever the level of expertise of their authors. Similarly, consultants are often engaged who will provide the safe, "right" answer without questioning the underlying assumptions on which studies are based. We regret to have to say that the present consultation is of that ilk; the Committee has assumed that the mainstream message on climate change is correct and is therefore looking narrowly about how to convince the public of this view.

RECOMMENDATIONS

15. Any government role in promoting good public understanding of climate change should be very modest until continuing research provides a far better picture of the drivers and likely progress of future global and regional climate systems.

16. Government should resist the temptation to encourage the spread of misleading and exaggerated information in support of the current focus on carbon dioxide emissions reduction.

17. Government should, via the education system, encourage basic scientific literacy (including, in particular, an understanding of the importance of testing hypotheses against observation), the use of evidence to come to conclusions and a healthy scepticism towards unsupported assertions. However, we recognise that a full understanding of climate science will remain the preserve of those with a higher level scientific education.

18. Government should review and improve the technical capabilities within the Civil Service in order to develop a more objective assessment regime for incoming advice from lobby groups with potential conflicts of interest. At the same time, government should expect an assessment to be made of *all* available evidence on climate change (as well as other issues) rather than just that which conforms to preconceived judgements.

April 2013

Written evidence submitted by Sciencewise (CLC013)

INTRODUCTION

1. This response to the Science and Technology Committee's inquiry has been developed by Sciencewise. Sciencewise is the UK's national centre for public dialogue in policy making involving science and technology issues. It is funded by the Department for Business, Innovation and Skills (BIS). We welcome the opportunity to provide evidence to the Committee. Our submission draws on our extensive experience of engaging the public in some of the most challenging and controversial policies involving science and technology, including climate change. We draw on wider evidence where appropriate.

2. Sciencewise's experience of engaging the public in a range of policy areas involving science and technology demonstrates that one way communications cannot be the only tool used by government to promote public understanding and behaviour change. A focus solely on promoting public understanding assumes that the reason the public rejects a particular policy is because there is a deficit in their comprehension of the issues. It assumes that once they understand the evidence they will change their minds and behaviour. The deficit model, as it is called, has been largely discredited and there is now more than a decade of deep, deliberative public engagement which can be demonstrated to have had a positive impact on public policy.

Q1. *What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?*

3. Dr Brigitte Nerlich from the University of Nottingham has produced a thoughtful blog post on this topic.[2] She points out that there are multiple meanings of "climate change", with the implication that it is important to be clear about which one means before beginning to examine public understanding, opinion or values. For example, it could mean "understanding" that:

- the climate changes over time;
- the climate is influenced by human activities or the emission of certain gases, especially carbon dioxide (or not);
- climate change is dangerous in various ways and to various degrees (or not);
- scientists produce climate models in order to understand and, if possible, predict, the causes and consequences of climate change (or concentration and impact of certain gases in the earth's atmosphere) and these are right/wrong/useful;
- climate change is a global phenomenon with distinctive local impacts (or not);
- scientists agree that climate change is a problem (or not);
- policy makers think they have to prevent the worst consequences of climate change (or not); and
- citizens should "do" something to prevent, mitigate, adapt to climate change (or not).

4. This analysis suggests that a simplistic definition of "public understanding of climate change" risks hiding a large number of issues which will have significant bearing on the policies government develops, their acceptability or otherwise to some or much of society, and their subsequent effectiveness.

[2] http://blogs.nottingham.ac.uk/makingsciencepublic/2013/04/07/public-understanding-of-climate-change/

Q2. *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

5. The search for actors who are trusted must go beyond scientists and policy makers. There are others who are often trusted by communities. The Sciencewise supported dialogue programme *Low Carbon Communities Challenge (LCCC)*[3] explored whether a community-led delivery could drive a broad uptake of low carbon technologies and lifestyles, among other things. The evaluation of the programme identified trust by and for local community initiatives, groups and organisations as an effective enabler of wider attitude and behaviour change.[4]

6. The impacts of the LCCC do show that community-led programmes can have real impacts in relation to tackling the implications of climate change. The overall evaluation[5] of the LCCC programme showed that it:

- increased awareness in local communities about local action on energy and climate change, from 35% of households to 42%;
- led to greater recognition of low carbon measures, with 77% of households in LCCC areas noticing at least one or two solar panels in their local area, up from 46% pre-LCCC (and over and above the increases seen nationally); and
- supported the normalisation of low carbon lifestyles, with an increase (48% to 55%) in the proportion who considered "reducing your carbon footprint" to be normal (compared to an increase from 40% to 43% seen nationally).

7. This question asks about public trust of different voices within the debate about climate change. However, it is important to note that trust is not a one-way street. Government must also trust the public and local communities. For example, the LCCC evaluation found: "A few local project teams welcomed the LCCC's hands off approach as it aligned with the "bottom up" ethos of the LCCC. It allowed local project teams to find their own solutions and suggested that government trusted their ability and competence to deliver."[6]

Q3. *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

8. As a mechanism for affecting people's views and actions, dialogue can have a significant impact. For example, feedback at the end of the Sciencewise supported Geoengineering public dialogue[7] (involving 90 people, chosen to be a cross section of the British public in terms of age, gender, ethnicity, and attitude to climate change), included the following findings:

- 90% of participants were convinced that climate change was currently affecting the planet; 46% of those were "totally" convinced—only 1 person was not at all convinced.
- 92% of participants said they were concerned about climate change; 53% of those were "very" concerned.
- 51% felt that climate change was caused by "mainly human activity", and another 43% felt it was caused by partly natural/partly human activity.

9. These are much higher figures on the impacts of climate change, people's concerns and the extent to which climate change is caused by human activity than the average UK public views suggested by polls. These sorts of changes in perspective and opinion are seen during many public dialogues. Taking one more relevant example: The DEFRA Climate Change Summit, a public dialogue in 2007 involving 152 participants, showed that:[8]

- 71% of participants said taking part had made a difference to what they thought; and
- 78% said they were likely to change what they did as a result of being involved.

10. However, just as trust does not work one way, the same is true of understanding. There is more than one way to achieve a low carbon economy. Dealing effectively with climate change requires a vast number of economic, social and cultural trade-offs and will have a profound impact on the lives of individuals and communities. Just as the public will need to better understand the scientific and economic constraints which the 80% carbon reduction commitment places on them, scientists and policy makers need to better understand public views on the different trade-offs that face them and their communities as policies are implemented to reach the target. Such understanding can help to inform the development of more effective policy, as well as the communication of the kinds of information the public feel they need in order to make decisions about their own behaviour.

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[3] http://www.sciencewise-erc.org.uk/cms/low-carbon-communities-challenge/

[4] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48459/5790-opm-evaluation-of-the-process-and-outputs-of-the-l.pdf

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48458/5788-low-carbon-communities-challenge-evaluation-report.pdf

[6] See p6 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48458/5788-low-carbon-communities-challenge-evaluation-report.pdf

[7] http://sciencewise-erc.org.uk/cms/geoengineering/

[8] Evaluation of Defra's public engagement process on climate change, Diane Warburton, 2008

11. A range of Sciencewise supported dialogues demonstrate the impact that public dialogue and deliberation can have on the understanding of policy makers and scientists about public opinion and understanding.[9]

12. Public dialogue can also be helpful for risk management. The Sciencewise evaluation found that policy makers who have taken part in a public dialogue see it as a valuable approach to managing risk in developing policy, and so improving policy and decision making. Their reasons included avoiding "another GM", saving money on policies that were then not implemented, avoiding unintended consequences and reduced vulnerability to criticisms from interest groups because of public as well as scientific input.

> *"The dialogue process allows different perspectives to come in. For government also risk management as well involved. If people disagree it is a good way to say we have taken into account public opinion. ... It was very useful when we were questioned by sceptics about why the research was licensed and we could refer back—robust evidence base—and say these are the findings. We had followed a robust process and this couldn't be questioned."*[10]

> *"It's risk management in terms of investment in science programmes. Also it's finding something you might not have thought about that will give you a different perspective."*[11]

Q4. *How important is public understanding in developing effective climate change policy?*

13. While improving public understanding is important, it cannot be the only response of Government to the gap between action and reality. The public controversies in the 1990s around science-related issues such as Mad Cow Disease and the application of GM technologies, made it evident to policy makers and scientists that the interface between science and technology, policy and wider society was not in a healthy state.

14. The House of Lords Select Committee on Science and Technology, reporting in 2000,[12] saw this as a crisis of trust rather than of public understanding, and that this should be addressed through dialogue:

> *"Direct dialogue with the public should move from being an optional add-on to science-based policy-making and to the activities of research organisations and learned institutions, and should become a normal part of the process."*[3]

15. Sciencewise[13] was formed in 2005 in response to this change in the debate in order to promote the greater use of public dialogue in policy involving science and technology.

16. Deliberative public dialogue brings two major benefits to policy development. On the one hand citizen participation of this sort enables questions to be raised and opportunities and priorities to be explored that might not occur to expert-led policy development; it is an enhancement to our democracy, alongside all the other formal and informal channels of democratic debate and governance. On the other hand, deliberative dialogue enables public values, views and attitudes to be explored and understood in depth; essentially an aspect of social research and the evidence-base it provides to policy. Both are important for better, more open policy making.

17. Effective public policy on climate change will therefore require far more than one way communication of the climate science and the Government's pre-formed view of its response to it. It will require government to open-up to different perspectives before the development of climate change policy. This does not mean handing policy over to the public, but integrating their views with other available evidence in order to develop more effective and efficient policy that is more likely to go with the grain of public opinion.

Q5. *What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?*

18. There is evidence of the effect happening in reverse: that public engagement affects public attitudes to climate change, and their willingness to participate in energy policies and initiatives and we have given some examples above.

19. We know from feedback on all Sciencewise public dialogues that people are more willing to engage once they have been involved in a dialogue.[14] Specifically in relation to technologies relevant for dealing with climate change, the evaluation of the Big Energy Shift Dialogue showed that:[15]

— 89% of participants said, after the third event, that their attitudes had changed, including becoming more interested in the technologies. Taking part also overcame concerns and increased the appeal of some (although not all) technologies (eg those who were positive about wind turbines in their community rose from 8% to 45%).

[9] http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Publications/Sciencewise-Evaluation-Report-FINAL.pdf
[10] p7 Sciencewise Evaluation Report, Diane Warburton, 2013
[11] p8 Sciencewise Evaluation Report, Diane Warburton, 2013
[12] Select Committee on Science and Technology (2000) *Science and Society.* Select Committee on Science and Technology—Third Report. London: House of Lords http://www.publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm
[13] http://www.sciencewise-erc.org.uk/
[14] http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Publications/Sciencewise-Evaluation-Report-FINAL.pdf
[15] http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Project-files/Final-BES-dialogue-evaluation-report-160810.pdf

— There was also a significant increase in the numbers believing that individuals should be responsible for technologies in the home (up from 49% at the start to 70%), and that communities should be responsible for technologies in their areas (up from 47% to 62%). Participants also reported making small changes in their own energy use, such as switching off lights, turning down the thermostat; some were also thinking about larger changes.

Q6. *Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?*

20. Behavioural sciences and behaviour economics can be a powerful tool for the development of policies and the communication strategies around them. However, such approaches work effectively only where they work with the grain of existing values.[16] More deliberative approaches can help to open up debates which are heavily value-laden, assist policy makers and scientists to better understand the range of values that exist within society and develop policy which more closely relates to them.

21. Climate change is an issue which affects, and is affected by, policy across government. For deeper public engagement, dialogue and indeed social marketing to be effective, common approaches and messages must be developed across Whitehall and beyond. Given its controversial nature, public engagement and communication on climate change requires deep and sustained stakeholder engagement as well. This engagement must find ways to deal with the conflict between very different world views which is preventing the development of a deeper, more open, public debate about the problem and its solutions, and hence effective implementation.

22. DECC has a good level of understanding about the value of engagement and dialogue as part of the solution. It has significant experience in engaging the public in different ways and on different facets of the issue, sometimes in collaboration with Sciencewise.

Q7. *Can lessons about public engagement with climate change policy be learned from other countries?*

23. A recent report for the European Economic and Social Council surveyed public and stakeholder engagement in the debate about the future of energy.[17] There is a lot of activity going on already at local, city, regional, national and pan-European level. The report identifies over forty public and stakeholder engagement processes across Europe and concluded:

24. *Trust building is key to dialogue* and mutual trust-building and constructive cooperation among stakeholders can help overcome the conflicts of interests inherent in developing climate change policy.

25. *Integrated involvement enables integrated energy policy* which is important as successful climate change policy requires behaviour change and this cannot be delivered by central government alone. The study found that dialogue processes can help build "joined-up" thinking—identifying opportunities for energy sector innovation at political, administrative, economic, social and environmental levels.

26. *Stakeholders and the public can work with complex data.* The study found that the fears of policy makers and scientists that scientific data and related evidence is too complex for the public to understand are unfounded. This has been demonstrated within Sciencewise dialogues as well.

27. *When done well, public involvement can mobilise people* as it seems to be able to engage "communities of geography" and "communities of interest", building networks (of networks) and partnerships.

28. Successful dialogue requires distinctions to be made between what is technically and economically possible, with what is socially and politically feasible and acceptable to citizens and stakeholders.

29. Dialogue on such complex controversial topics as climate change needs to happen over extended periods of time. However, ensuring coherent and timely "upstream" and on-going involvement strategies can be challenging across political cycles. Although participation of civil society is considered crucial for the implementation of ambitious involvement strategies, few implementation programs and activities consistently involved all main stakeholders.

30. The study concluded that engaging the public in dialogue about complex and technical policy issues can make an important contribution to a more transparent and open way of governing. It found clear evidence that engaging people in a meaningful way has the potential to change attitudes, behaviours and actions. It also found that involvement-led policy innovation can be a powerful means for agreeing and/or delivering national, regional, city, and local strategic objectives, at a lower cost to the public purse, in less time and with less bureaucracy than traditional processes.

About Sciencewise

31. Sciencewise's purpose is to support public bodies to develop more effective and efficient policies through the use of public dialogue. This is a particular type of public engagement[18] which brings together members

[16] http://www.involve.org.uk/nudge-think-or-shove-shifting-values-and-attitudes-towards-sustainability/
[17] http://www.eesc.europa.eu/resources/docs/20121212-final-report-eesc-comm-05–2012_formatted.pdf
[18] A good overview of different approaches can be found here: http://scienceandsociety.bis.gov.uk/all/files/2010/10/PE-conversational-tool-Final-251010.pdf

of the public, policy makers, scientists and other expert stakeholders to deliberate and come to conclusions on public policy issues, which can be at a national or local policy level. It is related to, but distinct from, consultation.

April 2013

Written evidence submitted by Caroline Peacock (CLC014)

1. My reason for studying climate change is that I live in County Durham, where I work as a Parish Clerk. To explain the relevance of that statement, I live in the English county that has committed itself more wholeheartedly than any other to combating climate change, largely through the installation of numerous on-shore wind turbines, and I work for a parish that is threatened with a windfarm on a highly sensitive site.

2. I appreciate that in making that statement I risk being immediately identified as a windfarm NIMBY but, if you will kindly read on, I hope it will be evident that any such accusation would be very wide of the mark!

3. In order to assist my Councillors, who have never faced a windfarm application before, I felt I should inform myself as thoroughly as I possibly could about climate change, and what perhaps can be done to address it. I am now three years into this process, and have been reading constantly about climate change issues, discussing such matters with experts, attending meetings of the CDALC (County Durham Association of Local Councils) Windfarm Working Group and, when possible, attending seminars on the subject. I have also talked at length to senior officers in planning, environment, landscape and archaeology in my local authority—and I pay them a tribute of thanks for being, in County Durham at least, unfailingly helpful and available. As a graduate of Durham University (BA Hons 1970), I feel that I have by now been able to bring a degree of understanding to the issue of climate change, and I emphasise that I have worked hard to approach everything I have read in a balanced, objective and unemotional manner.

4. I acknowledge that the climate is changing. I am aware that it has always changed. Over thousands of years, as is perfectly evident from ice cores, tree rings and a host of other sources, the world climate has been variable. There is also no doubt that we are at present in a period of extremes in many parts of the world, whether it be tsunamis in Asia, droughts in Africa, melting of ice at the Poles or plunges in temperature of the "cold wave" type that can be sudden, major killers.

5. If we accept that climate change is happening, and may be a threat, several questions arise:

   i. Can it be proved that human activity is to blame?

   ii. If so, can we do anything about it?

   iii. If the trend is irreversible, would we do better simply to focus on adapting?

6. In response to the first of these questions, my opinion, as a result of study on both sides of the debate, is that definitive evidence for *human-induced* global warming has not been conclusively assembled. The latest temperature graphs show a dip rather than the inexorable rise that global warming enthusiasts were predicting, and increasing numbers of well-respected scientists worldwide are revising their previously held positions. Many of them now admit to uncertainty whether this dip is the beginning of a reversal, or merely a hiatus in the upward progression of global temperatures.

7. Not being personally a trained climatologist, or even a scientist, I do not begin to judge myself capable of deciding which of those standpoints is right, but I do note that the consensus in the scientific world is fracturing. Meeting such divergent views, the question of whom I should I trust then becomes tricky. My response is to look at what motives may be behind those who espouse either argument, and I end up feeling suspicious of both. Scientists don't like recanting in public, so something powerful must be persuading them to do so—but are they being pressed from behind in some form, perhaps by those who have a commercial interest in purveying conventional forms of energy?

8. I also note, for example, that fear is a convenient manipulative tool for unscrupulous governments, and this makes me suspicious of those who seem too intent on alarming the public. Look at the apocalyptic predictions associated with the anticipated "Millennium Bug" or the AIDS virus, for example: In those instances, I don't know whether those who made predictions of global catastrophe really believed them or were simply using them as a tool, but both affairs demonstrated all too clearly that whipping up a public response as a result of scaremongering is neither constructive nor helpful, and the hysteria that ensued had to be very rapidly damped down again.

9. When I was young the prevailing fears related to the Cold War, which we assumed would mean invasion by the Russians, and the Atom Bomb, which we thought would be what they would use. We lived in a carefully orchestrated state of constant concern about both. Had we been told that the next four or more decades would see the collapse of the Soviet Union and no use of the bomb, we simply wouldn't have believed it!

10. Of course, being overly reassuring can be equally counter-productive. In this instance the public, often better informed than politicians seem to imagine, and certainly more level-headed, will doubt what they are being told. People tend to know when "positive" claims are being exaggerated.

11. Wind energy developers (please allow for the fact that my expertise, given that the planning application I have been considering for over three years is for wind turbines, tends to relate mostly to wind energy) are quite useful as an example of what I mean. They frequently make improbable and, on occasion, ludicrous claims for the efficiency of their technology. They make assertions that the public *know* to be untrue: for instance, when they claim that enough electricity will be generated to power so many thousand homes, many members of the public are quite knowledgeable enough to ask "for how much of the time?" We know, if only by observation, that wind turbines don't turn all the time and we also know, if we are remotely well-informed, that there is currently no really efficient method of storing the electricity generated by wind turbines, meaning that an alternative power source still has to be available as back-up; sensibly, therefore, we question the assertion. If we are rather better informed, we also know that the alternative power source most readily available at the necessary touch of a button is gas, because coal and nuclear can't be ramped up and down at speed—and equally that this country has been allowed to run alarmingly short of gas reserves, and so on. We therefore don't buy the smoothly delivered assurances.

12. Another frequent assertion by the pro-wind lobby is that there is no evidence of wind turbines damaging house values or tourism. The public are aware, of course, that no homeowner or estate agent hoping for a sale will admit to a difficulty, any more than areas advertising themselves as tourist destinations will. Knowing perfectly well that buyers, and visitors, evaluate the appeal of places on three characteristics: location, location, location, they understand that developers are bound to seek to reassure, and they take such assurances with a pinch of salt. The mantra "there is no evidence" will not convince them—and they areright not to be convinced because they know full well that it is in the interests of developers to conceal reports that support evidence of adverse effects. Despite all these reasons why adverse effects on house prices don't get into the news, however, there is ample and increasing evidence that house prices either fall dramatically in proximity to wind farms or that houses actually become unsaleable. Much the same "absence of evidence" is used *as proof* in the debate over the health aspects of proximity to wind turbines, an issue I certainly don't wish to address here, but which offers another example of how arguments are rendered unconvincing when it is evident that other interests may be at play.

13. Returning therefore to global warming (and I make a distinction here between global warming and climate change, as we all should) the public are also only too well aware that statistics can easily be manipulated. A decade ago, Professor David Bellamy said that it would be as easy to produce statistics to prove an imminent new ice age as to prove global warming. He was immediately condemned as a global warming denier, and suffered a drastic drop in media visibility as a result, but he actually never denied that the climate was changing, only that the interpretation of what was causing that change could be skewed according to what statistics one selected. That remains true, and people are rightly suspicious of those who cherry-pick statistics. Politicians should not be surprised, therefore, when that suspicion turns to cynicism.

14. How should a government seek to deal with public cynicism? In my view only with honesty, if such a thing is possible. For example, we mistrust bankers now, and we already mistrusted politicians, but we used to believe that we were at least being treated honestly by that icon of objective reporting, the BBC. What do we now know, some years on? That the BBC convened a panel to advise on what their editorial stance in relation to global warming should be, and that the balance of panel members was heavily skewed in favour of "warmists." Result: we are now even disbelieving of the BBC.

15. Instructive in this debate also is the shift in approach that has been adopted in recent years by some of our major charities. To take one example, the World Wildlife Fund used to send out its regular magazine detailing a horrifying list of catastrophes in terms of bird, animal and habitat losses. The supporter experienced several reactions—sorrow, guilt, despair, insignificance and ultimately negativity. In recent years the "pitch" has changed radically and the magazine, while still drawing attention to potential disasters and extinctions, gives a lot more space to a positive message, pointing to numerous successes. This gives supporters a greater feeling of empowerment, at least, and I assume must have worked in WWF's favour, as they have stuck with the new approach now for several years.

16. An additional complication is that the public are also aware of a moral argument in the climate change debate that makes many of us in the developed world feel uncomfortable. If, and it is not necessarily proved, but if global warming is to any major degree human-induced, then we are the people who have caused it. If we now try to inhibit the dash for industrial development and attendant prosperity being sought by other countries such as India and China, what justification do we have for that? Ignorance, originally, of the adverse effects we were causing might once have had some validity as an excuse but it hardly does now. We can seek to educate others, certainly, but getting on a high horse and preaching about it will not do us any credit.

17. What then strikes us, of course, is that if the developing countries can't be legitimately encouraged to make the sort of carbon-reducing efforts that we signally failed to make ourselves, then Britain's puny contribution to lowering CO2 emissions (paupering ourselves in the process and certainly drastically disadvantaging our industries) can only be of trivial significance. In other words, perhaps we shouldn't even try.

18. On the grander scale, of course, there is also another concern. Let's say we did manage to persuade the developing countries to develop their industry more sensitively than we did, would even that make any difference? There is the possibility, after all, that the forces of climate change are so ineluctable that nothing we humans can do will have any mitigating impact at all.

19. Which brings me to the third of my original questions—would we do better simply to focus on adapting? I strongly believe that, regardless of whether human activity can be shown to be responsible, we should do what we reasonably can to minimise our carbon footprint. I am proud to live in an area that has made such strenuous moves in that direction, not only by installing wind turbines in some of its less significant landscapes but also by permitting hydro-electric plant where viable and increasing installations for biomass digestion. County Durham is ahead of any other English county in these respects, especially when the amount of installed renewable energy in relation to its land area is taken into account.

20. I equally strongly believe, though, that we have a duty of care to preserve the riches of our natural environment, as they are central to our national health (lower-case letters) and our sense of well-being. We have an overarching responsibility to treasure our green spaces, our special landscapes, our natural and built heritage. We must never, never abandon that duty of care, for the sake of the generations that follow.

21. In this context, I do feel that we should put much more emphasis on *conserving* energy by building new homes in a more eco-friendly manner, and also by supporting homeowners to retro-fit older homes without crippling expense. Durham is one of the poorest English counties, probably only beaten by Cornwall to that distinction but, of course, with a far colder climate. Consequently my parishioners and others in Teesdale experience the most extreme levels of fuel-poverty anywhere in England. The ever escalating cost of fuel is a matter, here, of extreme local concern.

22. The answers are not always straightforward. To take our personal case: We live in an old stone farmhouse and, wanting to do the right thing in environmental terms, we studied in considerable detail whether it would be viable to fit solar panels or an air or ground source heat-pump. We concluded, with the help of expert advice, that so much electricity would be used in running the pump that this could never make financial sense—the payback time would be well over 30 years, not a decision you can easily justify when in your sixties.

23. We have, however, installed a new condensing boiler and our oil consumption has dropped significantly as a result, perhaps as much as 25% (unfortunately there is no mains gas here or we would have explored that option too). We have double-glazed our windows, lagged our loft to a good depth, added a porch to the house and so forth. All of these measures have been to some degree effective, but costly, and we know of many local people for whom such moves would be financially out of reach.

24. *Conclusion*: Government should, before anything else, encourage all of us to be more environmentally responsible on both the personal and industrial scale. That is because all gains made in those fields are long-term as well as being constant in terms of delivering benefit. We should be helped to make our homes as eco-efficient as possible, and we should be encouraged to travel as environmentally sensitively as possible, to recycle what can be re-used, and so forth.

25. Government should also study whether the renewable technologies are actually capable of delivering what their developers claim. The International Energy Agency has, for example, just published a new report indicating that a decade of investment in renewable technologies has delivered woefully little in the way of carbon dioxide reductions (see the Financial Times, 17.04.2013).

26. Against this background, Government should very seriously question whether some of the renewable technologies, which may be intermittent and relatively inefficient, deserve a place in landscape-rich inland locations where their very presence damages the qualities for which our countryside is renowned and valued both at home and abroad.

27. At the end of the day, every attempt to mitigate Climate Change should be weighed against its possible ill-effects. It is all a question of weighing advantages against drawbacks. A duty of care for our heritage, our landscapes, our tranquil places and our rich wildlife should carry *at least as much weight* as the duty to reduce our carbon footprint. Otherwise the environmental losses are at risk of outweighing the gains.

28. The public should be invited to engage in this debate, should be listened to and treated with respect, and should never be assumed to be ignorant or uninterested.

29. Once those building blocks are in place, the focus should be on what is efficient—in carbon reduction terms and in financial terms, certainly, but simultaneously in environmental and historical conservation terms—and this responsibility should be at the front of the Government's thinking. It's a big ask, and nobody promised that getting the balance right would be easy!

April 2013

Written evidence submitted by David Holland MIET (CLC015)

SUMMARY

1. The Committee's questions are based on a presumption which in my view is unwarranted, viz.:

— That climate science has yielded well founded conclusions which point to well defined and clearly desirable policy measures; and

— That full adoption of the required policies is or may become impeded by a failure on the part of the general public to grasp scientific realities.

— Hence a leading task of policy, to which the government should address itself, is to ensure better public understanding of "the science".

The questions that the Committee has posed reflect this ill-founded train of thought.

2. The main path to better public understanding lies in ensuring that scientific inquiries in the field of climate change measure up to well recognised professional standards. In particular, full disclosure of data, methods and procedures should be mandatory for all published work.

THE HYPOCRITICAL ROAD TO CLIMATEGATE

3. Leaks and legally enforced disclosures of authenticated information have played a large part in the loss of public confidence in climate science—as well as in unrelated fields. Successive governments have been wilfully blind to the hypocrisy, deceit and secrecy that have characterised the assessment of climate science from the inception of the Intergovernmental Panel on Climate Change (the IPCC).

4. According to John Zillman[19] it was formed, in part, after an impassioned plea at a 1987 WMO Congress for an "authoritative" assessment of what was known about "human induced climate change". Authority is a poor bedfellow to both science and freedom of information, but soon became the key purpose of IPCC Reports.

5. The prejudgement of catastrophic anthropogenic global warming (CAGW) in the opening statements of most IPCC founding governments is revealed in the report of the 1988 inaugural session of the IPCC, now accessible through the Internet. Sir John Houghton, formerly the chief executive of the Met Office, led the British delegation. His opening statement is reported as:

> *"[The] United Kingdom welcomes this initiative as an important step towards international consensus. The United Kingdom government has long expressed its concern about the increase in greenhouse gases. We are committed to action based on sound scientific evidence but the UK believes some action is already justified. .. "*[20]

6. Malta, in its opening statement foreshadowed the UN Framework Convention on Climate Change, which under a slightly different title it had proposed at the 43rd session of the UN General Assembly.[21] Only Israel pointed to the elephant that even in 1988 was waiting outside the room:

> *"We had some apocalyptic prophecies concerning the planet Earth, due to the global warming. .. .. But, before we cry "Wolf, wolf", we should have some scientific basis for the cry. Carbon dioxide increased considerably during the last thirty years but our comparison of 1920–50 normals with those of 1950–80 show some cooling and increase of precipitation, which is not in accordance with the global predictions for sub-tropical regions."*[22]

7. The American opening statement was balanced, if not as agnostic as that of Israel, and stressed,

> *"the need for strong, interactive peer review, as part of the working group process".*[23]

8. Although they headed their government delegations to the IPCC, Bert Bolin was chosen as the Chairman of the IPCC and Sir John Houghton as Chairman of the IPCC Working group One (WGI) that was to examine the scientific basis of climate change. Sir John held this post, or Co-Chairman, until work began on the Fourth Assessment Report (AR4) in 2002. By then the die was cast. The IPCC had become a secret society that is not open and transparent in the accepted sense of the words despite its Principles and Procedures demanding it and it being widely and forcefully promoted as such.

9. The technical chapters of the 1990 First Assessment Report of the IPCC (the FAR) were balanced. The now well publicised Figure 7.1 in Chapter 7 showed the then consensus view of earlier periods in the current interglacial period which were significantly warmer than the '80s.[24] The Chapter concluded with unavoidable logic, that without understanding what caused the earlier higher temperatures when CO2 concentration was much lower, it was not possible to estimate what part carbon dioxide played in the warming of the '80s. On the other hand figure 6.11 in Chapter 6 depicted computer projections of global temperatures for the year 2100

[19] Zillman, J W, 2007: Some observations of the IPCC assessment process 1988–2007. *Energy and Environment*, 18, 7 and 8, 869–891.

[20] http://www.ipcc.ch/meetings/session01/first-final-report.pdf : Annex III page 10

[21] Ibid page 5

[22] Ibid page 4

[23] Ibid page 10

[24] http://ftp.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_chapter_07.pdf

at various assumptions of the sensitivity of the climate to doubling of atmospheric CO2 concentrations with differing future emission scenarios.

10. In what has now become a routine practice of the IPCC, the Executive Summary of the Policymakers Summary of the WGI FAR emphasised the alarming outputs of the computer models, while minimising the deep uncertainties that remained within them. The bold headings on the first of the two page Executive Summary suggest to readers that they need read no further:

- *We are certain of the following:*
- *We calculate with confidence that:*
- *Based on current model results, we predict:*

11. Although the second page of the Executive Summary of the Policymakers Summary begins by stating in bold that "there are many uncertainties" the fundamental and enduring uncertainty of whether current global temperature is exceptional for interglacial periods is not mentioned

12. The WGI Policymakers Summary, in its Figure 8, displayed a computer simulation of global average temperature at 2100 AD comprising the "business as usual" curves from figure 6.11. These showed a rise in global temperature at 2100 between 3°C and 6°C.[25] However, the substantial variation in temperature between the Mediaeval Warm Period and the Little Ice Age which was thought to be unrelated to CO2, is not depicted or discussed

13. Despite this uncertainty in the FAR most of the world's governments signed the UNFCCC in 1992, which presumed that continued emissions of carbon dioxide *would* eventually lead to CAGW. Thus grew the hypocrisy with the IPCC's scientific role now subsumed into the political objectives of the UNFCC.

14. In 1993 the IPCC first formalised its procedures for preparation, review, acceptance, approval and publication of its reports. Openness and transparency were mandated in the first sentence[26] acknowledging the UN's longstanding commitment to freedom of information.[27] They have been retained as fundamental requirements in all subsequent updates to the procedures. However, these assessment procedures were and remain fundamentally flawed. The demands of the US delegation to the first IPCC session for strong *interactive* peer review were not implemented, which allowed the authors to ignore expert review comments.

15. This led to the controversy that followed the publication of the 1995 Second Assessment Report (SAR). Despite international agreement that the IPCC process be open and transparent, only in 2010—after Climategate—did a well researched account appear on the Internet, showing the role that Sir John Houghton had played in the last minute changes to the text.[28] Writing in 2008 Sir John Houghton implied that without them there would have been no Kyoto agreement.[29]

The Aarhus Hypocrisy

16. In 1998 environmental concerns led to the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention), which was designed for the Internet and email age that had arrived. It promised powerful rights of participation for the ordinary citizen to be implemented inexpensively by telecommunications. From Aarhus descended the Environmental Information Regulations 2004 (the EIR).

17. All EU members are legally bound by the Aarhus Convention not only to disclose environmental information but also to provide for public participation in environmental decision making processes, of which the IPCC assessments must rank as among the most important. They are also treaty bound by its article 3(7) to promote the application of the principles of the Convention within the IPCC. However, they repeatedly and manifestly failed and are intent upon continuing in the current Fifth Assessment Report (the AR5).

18. In 1999, the IPCC, updated its 1993 procedures which became "The Principles Governing IPCC Work" and its Appendix A, describing more detailed procedures for the assessment process. "Review Editors" were added to give the appearance of the balance that exists in journal review, but the authors continued to be free to ignore them as well as the advice of Expert Reviewers. Openness and transparency continued to be prescribed both in the Principles and the Appendix A Procedures. In a specific detailed rule, review comments were to be made available to Reviewers during the review and afterwards to the public in an open archive. However, no supervision of its rules was provided by the IPCC and in practice the authors ignored them with impunity.

19. Two innocuous looking Latin words in the otherwise plain English Appendix A retrospectively regularised the disputed late change to the 1995 SAR and effectively gave the final say on the scientific conclusions to a small group of scientists and government officials. Essentially the Summary for Policymakers

[25] http://www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_spm.pdf

[26] Appendix G: http://www.ipcc.ch/meetings/session09/ninth-session-report.pdf

[27] The1946 UN Resolution 59 began: *"Freedom of information is a fundamental human right and the touchstone of all the freedoms to which the United Nations is consecrated."*

[28] http://enthusiasmscepticismscience.wordpress.com/2012/04/21/madrid-1995-was-this-the-tipping-point-in-the-corruption-of-climate-science/

[29] Nature, Volume 455, Issue 7214, pp. 737–738 (2008).

became the prime output of the IPCC and, after governments agreed it, the technical reports were then accepted or approved *"mutatis mutandis"*.

20. The 2001 IPCC Third Assessment Report (the TAR) was pivotal. Out of apparently nowhere came the best known graph in history—the "hockey stick", which purported to prove that for 950 years before the modern industrial era global temperatures were as flat as a hockey stick handle before shooting up like its blade.[30] Critically this dismissed the question raised by the FAR of what part CO2 played in global warming, as it was now claimed that, other than from volcanic action, temperature changed little until CO2 increased. The IPCC claimed, based solely on computer models, that most of the recent warming was up to 90% likely to be due to humans.

21. The TAR had arrived at a watershed. In 1961, with remarkable foresight, Dwight D. Eisenhower warned of the combination of computers and state funding of science leading to the danger *"that public policy could itself become the captive of a scientific-technological elite."*[31] However, for most of the four subsequent decades only the universities, industry and government could afford or had the skills to use them. By 2001 the general public were rapidly acquiring computers encouraged by lower costs, simplified operation, the Internet and, by 2003, the interactive "blogosphere". This fostered public debate on every conceivable matter including climate change and also provided detailed reporting of the minutia on specialised topics that the public would otherwise never learn of.

22. To counter the growing criticisms of the TAR, and ensure the ratification of the Kyoto protocol, the "hockey stick" was relentlessly promoted in the mainstream media as proof of human causation of global warming, not least by Sir John Houghton who in 2002 published his views in a Royal Society of Chemistry book.[32] Freely available on the Internet, the public can now read of the features that Sir John said should characterise scientific assessments which form an input to policy making. Unsurprisingly, he claimed that these were to be found in the IPCC process. Of the third feature he stated:

> *"all parts of the assessment process need to be completely open and transparent. IPCC documents including early drafts and review comments have been freely and widely available—adding much to the credibility of the process and its conclusions."*

23. Sir John's claim was totally untrue and, as a Co-Chairman of WGI, he should have known it. Email enquiries revealed that only a single copy of some unspecified working documents of the TAR lie in eight unindexed boxes at a Harvard library where by prior appointment they may be examined. The Curator was unable or unwilling to tell me if anyone ever had.

24. The 2007 AR4 was prepared under greater scrutiny by an increasingly self-educated Internet-savvy public, growing numbers of whom were deeply sceptical of both the IPCC process and its conclusions. When AR4 was found to contradict the already published conclusions of expert panels that had reported to the US Congress, freedom of information requests began in the USA and followed in the UK.

25. The Climategate releases of November 2009 followed what many believed to be the unsatisfactory responses of the UK public authorities to the 2008/9 FOIA requests for information on AR4. In a scarcely coded instruction released under the FOIA in April 2009, the then working group Co-Chair, Susan Solomon, had advised the UK IPCC participants and their public authority employers that further disclosure was "inappropriate". They then colluded in various ways to deny all information requests relating to AR4. It is beyond reasonable doubt that some committed criminal offences.

26. In 2009, just weeks before Climategate, and despite the ongoing IPCC *omertà* which was widely discussed on the Internet, the IPCC Chairman, Rajendra Pachauri, told Australian TV viewers:[33]

> *Whatever we do is very transparent. Every stage of the drafting of our report is peer reviewed, and whatever comments we get from the peer review process are posted on the website of the IPCC, and the reasons why we accept or reject those comments are clearly specified. Where we accept a comment we say, "Yes. Accepted." Where we don't, we have to adduce very clear reasons why the authors don't agree with the comment. So it's a very transparent process.*

27. Climategate proved Dr Pachauri's claim to be no more true than Sir John Houghton's had been. Climategate confirmed that the "hockey stick" was improperly introduced into the TAR and improperly retained in AR4. Upon learning of what was popularised as the *"hide the decline"*, Professor John Christy, one Lead Author of the TAR "hockey stick" Chapter released what is called the Zero Order Draft (ZOD). This shows that the *"decline"* in Professor Keith Briffa's proxy temperature curve, which was being used to corroborate the "hockey stick", was not originally hidden. On subsequent drafts the decline was simply "amputated", but how and why was not explained at the time to, or agreed by, all the chapter authors. In the summary of his evidence to the US Congress, Christy wrote:[34]

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[30] The so-called hockey stick studies of Mann, Bradley and Hughes were in fact limited to the Northern Hemisphere and the uncertainties were well explained to anyone willing to buy the journal. To the public in general it was presented without caveat as proven science.

[31] http://www.pbs.org/wgbh/americanexperience/features/primary-resources/eisenhower-farewell/

[32] http://www.rsc.org/ebooks/archive/free/BK9780854042807/BK9780854042807–00001.pdf

[33] http://www.abc.net.au/7.30/content/2009/s2700047.htm

[34] http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/ChristyJR_written_110331_all.pdf

> *"Regarding the Hockey Stick of IPCC 2001 evidence now indicates, in my view, that an IPCC Lead Author working with a small cohort of scientists, misrepresented the temperature record of the past 1000 years by (a) promoting his own result as the best estimate, (b) neglecting studies that contradicted his, and (c) amputating another's result so as to eliminate conflicting data and limit any serious attempt to expose the real uncertainties of these data."*

28. Your Committee, hobbled by the impending 2010 general election, missed the opportunity presented by Climategate to fully expose the faults that run through the IPCC and its expert network. Key witnesses obfuscated. The UEA's Vice Chancellor, Professor Edward Acton, repeatedly told the public, the media and your Committee that Sir Muir Russell would fully investigate the allegations raised by Climategate which under a £40,000 agreement included the illegal withholding of information that I had requested.

29. Despite this, Sir Muir confirmed to an Information Tribunal on 15 January 2013 that he had decided not to investigate alleged criminal offences even before 1 March 2010 when he appeared before your Committee. By the end of March 2010 both Sir Muir Russell and several senior individuals in the University of East Anglia and the Met Office knew that, after I had requested it, the information had indeed been deleted from the university computers, but only after copies were made that were taken off site.

30. Professor Acton told the same Tribunal that he only learned that Sir Muir had not done as was agreed upon reading his report in July 2010. He also repeated the claim that he had made to your Committee on 27 October 2010 that he had personally asked Professors Briffa and Jones if they had deleted any emails that were the subject of freedom of information requests and been assured in signed statements that it had not occurred. Subsequent to the Tribunal hearing Professor Acton supplied an unsigned copy of a letter from Professor Briffa that gave only limited assurances and made no mention of his illegal concealment of the information that I had requested.

31. The Climategate releases of November 2011, which received little interest from the mainstream media, confirmed that the information I had requested was indeed deleted from the University computers, for which the only logical purpose was to prevent its disclosure. The most recent release of the encryption key to all 220,000 Climategate emails has yet to uncover any dramatic new information but substantially corroborates what was known.[35]

32. The IPCC Fifth Assessment Report (AR5) now underway will be no less controversial than the last three. Despite the Internet age and the strong desire for openness and transparency, those serving the IPCC and their public authority employers are determined to deny the public their Aarhus Convention rights. This encourages the leaking of the information. Seven of the AR5 WGI ZODs and all of the second order drafts (SODs) are on the Internet along with most of the documentation of the other two working groups. Despite this, the Met Office are opposing my appeal to the Information Tribunal for the remaining seven ZODs on the absurd grounds that releasing them will damage international relations.

Conclusions

33. I submit that no amount of marketing or advice on social and behavioural sciences will help rescue climate science, climate policy, the IPCC and its assessment process from the inexorable rise in scepticism which is based upon solid evidence of secrecy, chronic corruption, and self interest. If the Committee wants to restore public confidence in the science and policies of climate change, it needs to throw its full weight behind the complete openness and transparency, which Sir John Houghton said was necessary.

April 2013

Written evidence submitted by Professor Anthony Trewavas FRS, FRSE (CLC016)

1.This short paper is written by Professor Anthony Trewavas FRS, FRSE, Academia Europea. It is in response to a request from the Science and Technology committee for information on why the public seem disinclined to go along with its policy on climate change. That assumes its policy is correct, I see a need to be more circumspect. In summary, the following are outlined.

- The difference between projection and prediction.
- The necessity of scepticism in climate science and the difficulties in testing climate models.
- Whether CO_2 increase is the driver of climate temperature or is it the reverse?
- I conclude that a lack of certainty should lead to removal of legislation.

2. Unless otherwise stated, the climate evidence to which I refer is to be found on http://climatedata.info and its various subsections on proxies, ice cores, etc. This site provides a scientifically-balanced introduction to climate data.

[35] On 13 March 2013 the encryption key for all the 220,247 emails, which had been taken in 2009, without authority, from the Climatic Research Unit, was released conditionally to many individuals worldwide.

The Difference between Projection and Prediction

3. That there are problems with the public perception of climate change is not surprising and results from the common confusion between predictions and projections. A prediction is a defined future; instead, a projection is what might happen. It is the difference between certainty and possibility. Unpredictable events, large volcanic eruptions, asteroids can destroy all attempts at prediction as can changes in technology.

4. Hydraulic fracturing is just one instance; its introduction has made nonsense of many predictions of fossil fuel limitations of natural gas resources and also inadvertently reduced USA emissions*. There will be other technological advances; we are a highly creative species.

*[Any scrutiny of the US governments EIA (environmental information administration) would have indicated several centuries worth of technically recoverable reserves of coal, oil or gas].

5. Climate models can only provide projections, they are not predictions. Confusion between these different words has led to many climate models being presented by government, NGO's and some scientists as predictions. No doubt those scientists, who did so, were well meaning. They admitted sometimes to exaggerating effects to convince the public. But the role of science is to provide unbiased, balanced assessments. If the public are told that climate science predicts continual warming then several very cold winters, leads to rejection of the claim. The complexity of climate renders predictions impracticable and there is need for honesty and transparency about the uncertainties of climate change. What was omitted was that climate models at best only offer probabilities, something it was felt the public would not understand.

The Essence of Science is Scepticism

6. Sceptical assessments form the basis of scientific progress. Models are only as good as the information put into them. Questioning climate models is an essential part of progress on understanding.

7. Those who produced climate models should have been those most vigorous in attacking their own hypotheses and making others aware of their limitations. That is how scientific knowledge expands. Instead as the unfortunate case at the University of East Anglia showed, this group were acting as cheerleaders of their own modelling even to the extent of attempting to damage the credibility of those that questioned what they had published.

8. The term Denier or Denialist to describe sceptics is indicative of the closed mind and a term of abuse for the scientific process. It is reminiscent of Galileo's problem with the inquisition in the 16th century and politicians of all kinds should have slapped the term down.

9. The last IPCC in 2007 indicated that there were some 20 or so different models, projecting estimates anywhere from 1.5 to 6 C for either 2100 or a doubling of CO_2 levels. That in itself should have negated the notion of climate models as predictions. It indicates climatological uncertainty. The variety results from different basic assumptions but given there is only one future, only one model or none can actually prove right.

Can Climate Models be Tested or Refuted.

10. Karl Popper laid down some simple criteria of a scientific enterprise. What is proposed must be capable of being tested or refuted. Whereas normal science is experimental and conforms readily with Popper's description of easy refutation, climatology is reduced to modelling only and thus suffers inevitable uncertainties because knowledge is incomplete. The extent of ignorance is unknown. The only way a climate model can be refuted is to compare the projections over suitably long periods of time (15–20 years) with actual climate observations. If policy is based on models, as is the case, there is a large inherent risk that after 20 years the policy will have been seen to be wrong because the model was inaccurate. Is this not now beginning to be the case?

11. All the models proposed in the late 90's and early noughties have so far proved poor predictors of climate temperature variation and I refer to the apparent stasis in temperature from 1998 onwards. A similar period of stasis occurred in the 1940's and in both cases atmospheric CO_2 continued to climb. If this coming year continues, as the previous 12–14 years, then the 95% confidence level around the current common mean projected climate temperature, will have been breached (E. Hawkins. www.climate-lab-book.ac.uk/2013/updated-comparison-of-simulations-and-observations). [A breach of the 95% confidence level indicates a probability of less than 1 in 20 and is usually used in all areas of statistics to indicate high significance].When politicians were urged to act by some scientists, none of the climate models generated at this time included a period of stasis. All should have been more circumspect.

12. The apparent stasis indicates that there are aspects to the climate which modellers have not taken into account because they are not understood. Natural variation is one ascribed reason and something studiously ignored 20 years ago when mankind was blamed for any change of climate. I know of no unambiguous way in which natural variation, whatever it is, can ever be distinguished from mankind's contribution. Even if the climate temperature had varied as models indicated for a decade or more that does not indicate it is correct. Correlations are not proof.

13. The climate temperature can do one of three things; go up, down or stay the same. Given the errors in modelling it seems to me that modellers have a one in three chance of being approximately right. If the projected temperature is increasing slightly faster or slower but similar to the general direction, I get the impression most modellers would consider they were justified in their claims. But even with these three categories, the current set of models have failed because the temperature is, at present, approximately constant so they have failed on a one in three chance.

14. The reaction by some scientists to the apparent stasis has been to state that the temperature of the last 20 years is higher than the previous 20 years and therefore climate models and assumptions are correct. The climate temperature has been rising for the last 150–300 years depending on whose results you look at, so that is hardly a surprising observation. Current models are poor predictors and that creates uncertainty for policy decisions.

15. If climate change is primarily natural, nothing can be done except to adapt. To describe climate change as dangerous is to downgrade our ability to create solutions and is not based on real situations given the enormous complexity and difficulty of predicting any future world situation.

MISLEADING "HOCKEY STICKS".

16. The original "hockey stick" graph of climate change was generated by Professor Michael Mann at Pennsylvania State University. The graph figured strongly in the IPCC 2000, notably on the cover and five times elsewhere in the report but it is an artifice. What was not made clear at the time is that the flat part of the graph is a temperature proxy (dendrochronology) whereas the increasing part that was grafted on to it is actual temperature measurements.

Tree rings are formed by the activities of the dividing cells of the cambium, a kind of inner sheath, that generates new phloem to the inside and new xylem to the outside of the cambium. Tree rings are part of the process of plant development in large woody dicotyledonous angiosperms. Because it is development, the size of the tree ring is determined by everything that affects all aspects of plant development. These are : soil nutrients and structure; light variations; carbon dioxide; competition from other trees; disease; predators; age; rainfall; previous developmental activity as well as temperature. Temperature, for which it supposedly acts as a proxy, is just one contributor amongst many and of course reflects local conditions only. Mann's "Hockey Stick" failed to register the historical variation of warm medieval period when Greenland was actually green and the little ice age that dominated in the years 1600–1700s. Greenland was abandoned in the late 1400's as temperatures declined. Tree rings on their own are not a reliable proxy and examination of tree rings from trees from numerous sites indicates inconsistencies. Stable isotope analysis of tree rings may be more useful. Policy was probably influenced by this uncertain information.

THE CONFLICT OF CARBON DIOXIDE AND TEMPERATURE.

17. Paleoclimatic analysis has indicated that CO_2 concentrations in the atmosphere have varied enormously; in the past up to ten fold higher than current levels. In the Milankovitch cycles, temperature rises precede those of CO_2 and CO_2 lags temperature during the falling phase.

18. Atmospheric CO_2 levels deduced from ice cores have been rising since 1750. That observation is puzzling for the popular view, that all CO_2 results from anthropogenic sources. The world population then was about a tenth of that today, fossil fuel use was largely limited to the UK and photosynthesis and the oceans should have sequestered any increase. The increase in CO_2 in the 1800s is ascribed to massive forest clearing, supposedly reducing photosynthetic area, and increased use of wood for fuel. Even so there is no simple relation with population here. Subsequent industrialisation and fossil fuel use has left its isotopic mark in the atmosphere [Ghosh, P. Brand WA. International Journal of Mass Spectrometry 228 (2003) 1–33].

19. From 1880 onwards, direct measurements showed ocean surface temperatures declined for about 20 years and then have risen continually since. Like other direct temperature records, a century is a short time in climate terms. But the solubility of carbon dioxide in water is temperature dependent, so as global temperatures have risen, it is likely that less atmospheric CO_2 will be absorbed and more dissolved CO_2 will be released. This then gives rise to the question of whether it is CO_2 that causes temperature increases, or temperature increases give rise to elevated atmospheric CO_2, or a mixture of both.

20. Norwegian geoscientists [Humlum et al., 2013. Global Planetary Change 100, 51–69] have provided the first detailed analysis of the potential phase relationships between global temperature records, global CO_2 levels, ocean surface temperatures and anthopogenic CO_2 from 1980 to 2011, using Fourier analyses; the appropriate mathematical way to detect phase sequences.

21.Their exacting analysis has turned climate models on their head. These analyses indicate that temperature increases first in the ocean surface, followed by atmospheric temperature and then nearly a year later by atmospheric CO_2. The lag in CO_2 they ascribe to delays in mixing. They also report that anthropogenic CO_2 is only a small contributor to the overall temperature.

22. I quote to indicate their conclusions. "As cause always must precede effect, this observation demonstrates that modern changes in temperatures are generally not induced by changes in atmospheric CO_2. Indeed, the sequence of events is seen to be the opposite: temperature changes are taking place before the corresponding CO_2 changes occur". "Our figures 2–8 reveal that the common notion of globally dominant temperature controls

exercised by atmospheric CO_2 is in need of reassessment. Empirical observations indicate that changes in temperature generally are driving changes in atmospheric CO_2, and not the other way around". "Our analysis suggests that changes in atmospheric CO_2 appear to occur largely independently of changes in anthropogene emissions. However, by this we have not demonstrated that CO_2 released by burning fossil fuels is without influence on the amount of atmospheric CO2, but merely that the effect is small compared to the effect of other processes". The conclusion of these authors is that the present high period of solar activity since 1920 may be responsible for the changes detected in atmospheric CO_2.

23. While their analysis will no doubt be further examined, particularly by those with a vested interest in the *status quo*, these observations indicate why no government should have legislated on anthropogene emissions because the situation does not have the certainty originally claimed.

24. There is no direct relationship between rising atmospheric CO_2 and global temperature, as the temperature stasis periods during the 40's as well as from 1998 onwards indicate. However all models seemed to have assumed that rising CO_2 must drive temperature increases , ever since Arrhenius identified the potential for CO_2 as a greenhouse gas over 100 years ago. The paper by Professor Humlum and others is salutary in that things are not always what they seem.

25. Complex equations are used for climate models and the equations are constrained to fit known temperature changes. Using the relatively rapid temperature rise of the late 90's to fit these equations might account for the continued increase in temperature that models predict but which failed to match actual observation. A Norwegian group has incorporated the present stasis in a model and calculated an acceptable 1.5 C rise for CO_2 doubling.

Legislation on Climate Change should be Revoked.

26. I feel very strongly that legislation on climate change should not have been enacted. Climate science is young and there is a deal of uncertainty in its claims. Legislation has propelled us on a path which is difficult to retreat from but is going to inflict real damage on our economic activity and wealth because we are going to make our electricity, the life blood of all economic activity, the most expensive world-wide. No doubt the gesture of reducing emissions was considered noble but it has now turned into the ultimate gesture politics because no one else in the world is going to follow suit. This policy will merely accelerate the decline of the UK and Europe.

27. In seeking to understand the alacrity with which the popular view of climate change as being anthropogenic was incorporated into law, three additional reasons can be given as well as the assumption that temperature rises were mankind-induced.

(A). There is the claim by developing countries that western industry and society is guilty of the present state of atmospheric GHG. The West may have accounted for much atmospheric GHG but good use has been made by inventing mobile phones, tarmacked roads, railways, aeroplanes, the internet, computers, trains, modern agriculture and food abundance, modern transport, electricity and use of gas, metallurgy, books, science, antibiotics, vaccines, modern medicine, liners, steel ships, etc. The world has benefited.

(B). Highly-publicised agitation by well-funded, well-organised but largely unqualified ideological groups. Often self-righteous, they, seemingly, are against all human progress.

(C). Unreliable world sources of energy. Shale gas and hydraulic fracturing has changed the UK perspective. Methane can be derived from coal seams.

28. The effect of legislating on climate change was to emphasise renewables in generating policy on the basis that they are free at source. So are coal, oil and gas; exploitation is what costs. All "renewables" require huge areas of land or sea to gather energy (MacKay, DJC. Sustainable Energy without the Hot Air). Because of subsidies to these, there has been no financial driver to investigate alternatives that are recognisably less damaging to the countryside and seas. Even the use of thorium or modular nuclear reactors seems to have been discarded, despite the UK being at the forefront of nuclear technologies in the past. There's enough uranium in the oceans to last for millions of years. The cost of renewables places the heaviest burdens on the poorest. The increasing proportion of renewables in electricity generation will eventually threaten its stability.

29. Criticism of claims about the extent of emissions reduction from renewables needs to be acknowledged.[36] Renewables damage to the countryside is only perceived by those that live there but unspoilt countryside is at a premium in this crowded island.

30. Much is made of the supposed consensus on climate change but this was initiated by Arrhenius who identified CO_2 as a GHG and who calculated that a doubling of CO_2 would increase global temperature by 2 C, a value little different from most models. But Arrhenius' knowledge of climate was limited and a major failing was not to include the negative feedback of clouds although he recognised the effect of water vapour on temperature. Since that time, climate scientists of all kinds tend not to think outside this box and are constrained to incorporate that simple idea that "CO_2 must drive global temperature". There is enough discrepancy to indicate that a reassessment of that simple idea is essential. Discarding Arrhenius' simple

[36] joewheatley.net/how-much-co2-does-wind-power-save/ and www.clepair.net/IerlandUdo.html. Wheatleys article is "in press"

relation as a simplification that does not match the real world would be a start. Climate is a very complex interactive system and systems properties are often counterintuitive.[37] I suspect Professor Humlum's group assessment will turn out to be more accurate than the popular view of climate.

31. It would help if the committee acknowledged the uncertainty.

April 2013

Written evidence submitted by Jonathan Peacock (CLC017)

1. I am a private person with a science degree (BA Chemistry, Oxon) and a strong interest in the climate and energy debate, in which I have read widely.

2. Gentlemen, the great difficulty for both Government and the media in this debate is that the British public is not as stupid and uneducated as they might wish. The public in general might not have an advanced scientific education, but they are not all ignorant and many have a strong sense that they are being mislead and ill-informed.

3. Public understanding of the issues involved is quite good, even if it does disagree with the present political stance. People have been told for years that global warming will destroy mankind, and it is all the fault of human civilisation. However, seeing the climate of the planet has never been stable for 4 billion years, it might be sensible for those trying to get the message across to begin by acknowledging this fact, and to admit that human activities are only contributing a proportion to any drivers of change which is happening anyway, and that climate change is absolutely unavoidable, and will happen anyway regardless of any steps taken by humans.

4. The matter of who is trusted in this debate is extremely vexatious, as both politicians and much of the media have destroyed trust over the years. Sadly a proportion of the scientific community is also implicated in some of the reprehensible attitudes and activities, which really does raise the question as to who will be trusted. The IPCC claimed the right to be the authoritative voice, but has been shown to have employed flawed methodologies which have led to nonsensical forecasts. The BBC, to take another example, has taken such an extreme and biased view, shutting down any balanced debate in total breach of its charter, that it is now not trusted at all in this matter. Politicians have spent years telling us of the imminence of disaster—but that their energy policies would prevent Armageddon and cost little. We are now faced with rapidly escalating fuel bills, the closure of sections of our manufacturing industry with commensurate loss of jobs and no significant change to global emissions.

5. If a more credible picture was described by politicians and their tame scientists it would come across better to the public. If the public could see that the position being put forward was being genuinely debated by scientists on both side of the argument they would be more likely to believe the consensus arrived at. To merely demonise any scientist who has the temerity to disagree is totally self-defeating for proponents of climate change. David Bellamy was vilified for daring to say that he found the global warming thesis (as it was being expressed then) unconvincing, and many other serious scientists have experienced the same thing. Even the supposedly serious journal New Scientist published an extraordinarily distorted article by a proponent of wind farms, but would not publish a balancing view on the grounds that the first one was "an opinion".

6. However, public opinion should certainly not be significant in developing climate change policy. All policy should be developed educated experts in the area who understand all the issues and, more importantly, the positive and negative consequences of any policy arrived at. There will inevitably be both, and the public knows this, so they will only accept policy if both aspects are explained.

7. It is surely a general truth that the public attitude to any policy will affect their engagement with it. The two crucial issues are the understanding the public has and their belief that all are working in the same direction.

8. The question as to whether the Government has sufficient expertise to understand the relationship is truly horrifying. It appears to presuppose that Government is always right, and that it is merely a matter of manipulating public understanding to achieve their aims. The answer is that while the public have such a deep distrust of politicians and the press there is now little chance that the public will follow in a docile manner.

9. Lessons probably can be learnt from other countries, but when the British public see that Spain is cutting its subsidies to wind power, China and America have refused to sign up to the various international agreements to limit greenhouse gases, and that Germany is now building coal-burning power stations, it is a question of what lesson the Government wants to learn. Both Germany and Switzerland changed their stance on nuclear power post Fukushima, presumably because they feared a tsunami would strike, so are these sound models for our policy makers?

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[37] For example, car speed is a simple interactive system and most would intuitively identify the accelerator as the speed control. But changing down, brakes, going up or down hill etc., all contribute to speed, indicating the accelerator is not the simple control implied.

Joint written evidence submitted by Adam J L Harris, Nigel Harvey, Leonard A Smith, David A Stainforth, Erica Thompson (CLC018)

Executive Summary

Our main aim is to address the following point in the call for evidence from the Science and Technology Committee inquiry into "Climate: Public understanding and policy implications":

— *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

We begin by discussing the wider context of the challenges and relevance of public engagement with science and with scientific uncertainties. We go on to comment on the way uncertainties in future climate are often characterised today. We end with discussion of some significant issues regarding the character of climate prediction uncertainties and their relevance for public understanding.

To increase public trust in the results of climate science, we recommend that the uncertainties inherent in climate forecasts be made explicit. In cases where these uncertainties can be legitimately expressed as probabilities, we suggest that use of a dual verbal/numerical format for expressing uncertainty (eg, "likely (65–80%)") will enhance communicative effectiveness. We also propose use of the verbal confidence scale developed by the Intergovernmental Panel on Climate Change for their Fifth Assessment Report, especially important in cases where there are underlying problems in expressing the uncertainties as probabilities. Finally, we see the media as having a role in helping the public understand how forecasts are generated from models of the climate and, more particularly, the degree to which diversity in outputs from these models reflects uncertainty in those forecasts.

Brief Introduction to Submitters

This evidence has been collated by five people with relevant expertise. Adam Harris is a Lecturer, in the Department of Cognitive, Perceptual and Brain Sciences at UCL. He has published research on the communication of environmental risks within the context of climate change. Nigel Harvey is Professor of Judgment and Decision Research at UCL and Visiting Fellow in the Department of Statistics at LSE. He has published research on the role of judgment in forecasting, on determinants of trust, and on the quality of subjective estimates of probability. Leonard Smith is Research Professor in the Department of Statistics at LSE and Director of the Centre for the Analysis of Time Series. He is also a Programme Director at the Centre for Climate Change Economics and Policy and Senior Research Fellow at Pembroke College, Oxford. He has published widely on the role of models in weather and climate research and on the interpretation of ensemble forecasts derived from such models. David Stainforth is Senior Research Fellow at the Grantham Research Institute on Climate Change and the Environment at LSE, where he is on the lead staff of the Global Response Strategies Research Programme. He co-founded and was chief scientist on the climateprediction.net project, the world's largest climate modelling experiment. His work focusses on how robust and useful information can be extracted from climate modelling experiments and on how to relate climate science to real-world decision making so that it will be of value to industry, policy makers and wider society. Erica Thompson is a Research Officer in the Centre for the Analysis of Time Series, working on the Munich Re Programme evaluating climate risks and opportunities.

Basis for Recommendations

Introduction

1. Policy makers are frequently considered the primary consumers of statements about future climate. Public support for policies, however, is critical to ensure their smooth implementation: they will be more effective if people comply willingly with them. Such support depends on people's trust in both policy makers and their scientific advisors. That trust, in turn, depends both on perceived competence and on perceived benevolence of motives: policy makers and their advisors may be mistrusted either because they are seen as well-meaning but incompetent or as competent but with a hidden agenda that favours vested interests.

2. Greater trust in scientific estimates of climate change is likely not just to increase support for government policies addressing it but also to lead to an increase in personal behaviours that may mitigate it. For example, people may reduce car use or increase home insulation.

3. Previous problems with policies based on uncertain science have arisen because people were given the impression that our knowledge was more certain than it was (BSE) or because, consequent on this, they did not trust assurances that our knowledge had a firm basis when it actually did so (MMR). The lessons we need to learn from these events are that 1) we need to make levels of uncertainty associated with the science underpinning our policies explicit and 2) we need to make our rationale for those uncertainty estimates explicit. We need to do these things to increase trust. As Paul Slovic has pointed out, transparency (not withholding information) is a factor that increases trust: it reassures people that there is no hidden agenda.

4. Climate modellers have developed a number of techniques that allow them to produce estimates of uncertainties associated with different degrees of climate change under specified assumptions. Climate scientists do not, however, always consider the diversity of their models to reflect probabilities expressing uncertainties

associated with their forecasts. Moreover, a model-based estimate of probability is always incomplete without an accompanying (quantitative) estimate of our confidence that the model is able to provide meaningful information. To put this the other way round, as is often the most useful way of presenting it, what is the probability that the model is misinformative?

5. It is also important to recognise that different aspects of the climate problem have different characteristics of uncertainty. Basic science is sufficient to know that continued anthropogenic emissions of greenhouse gases at the current rate will lead to a warmer planet and climate disruption with severe negative consequences for society. The details of how that will play out and the detailed national benefits of any particular mitigation policy is still an area with substantial and conceptual uncertainties.

6. In summary, people must feel that current knowledge is reasonably sound, that its limitations are being honestly communicated to them, and that policy makers take account of these limitations. This, in turn, implies that the public should somehow be made aware of the uncertainty estimates associated with climate forecasts (including the uncertainty in so-called probabilistic projections) and they should be helped to understand how we can have confidence in the big picture without being able to predict the details. We now turn to problems associated with communicating this uncertainty.

7. Climate models have been used to produce "probability estimates" but these estimates come from different methods with different assumptions and often different models. We do not yet have methods to provide robust probabilities for many detailed aspects of future climate change. Thus, there are two distinct challenges: one is to communicate probabilities when we have them; the other is to communicate uncertainty when such probabilities are not available.

Communication of probabilistic information

8. To address the first challenge, the Intergovernmental Panel on Climate Change (IPCC) adopted a policy of providing an explicit mapping between seven verbal terms and seven ranges of probability. The probabilities could then be expressed in verbal terms. Thus, in the IPCC mapping, "virtually certain" refers to probabilities in the range 99—100% whereas "likely" refers to probabilities in the range 66—100%. This approach allowed results from experts who disagreed about precise numerical probabilities to be expressed in the same verbal terms. Thus, an expert who associated a probability of 70% with a particular future event and another expert who associated a probability of 90% with that event could both be said to assess the event as being "likely".

9. However, there are a number of problems associated with translating probabilities into verbal terms. First, terms, such as "virtually certain" and "very likely", are intuitively matched up to different ranges of probability by different people. Thus, "very likely" may refer to probabilities in the range 85—95% for one person but to 70—85% for another. Of particular relevance here, recent studies have shown that the particular mapping adopted by the IPCC is not consistent with how people naturally use the probability terms included in the IPCC mapping. Furthermore, the range of probabilities associated with particular verbal expressions depends on various other factors, such as the seriousness and the expected frequency (base rate) of the event to which the term refers. Thus expressions referring to more severe outcomes are interpreted as denoting a higher probability.

10. Given these problems with translating probability information into words, why should it not be communicated in its raw numerical form? There are two arguments against this. First, a single probability may give the impression that uncertainty estimates are more accurate than they are. This can be countered by using numerical ranges of probabilities (eg, 70—85%). Second, it is sometimes claimed that residents of the United Kingdom cannot easily understand probabilities and that information (eg, weather forecasts) should therefore not be given probabilistically. To address this, both verbal terms and a range of numerical probabilities could be used to express the uncertainty associated with a particular event. Thus, an event could be labelled as "likely (65—80%)". Providing information in this dual form would supply probability information to those who can benefit from it without removing the verbal expressions of uncertainty from those who cannot.

11. People need not be given probabilities (or ranges of probabilities) for particular events. Decisions usually need only an estimate of the likelihood that some critical threshold for a particular impact is exceeded. Uncertainty expressed in this way also provides a succinct message that the public are likely to understand easily: for example, a hypothetical message that "it is likely (65—80%) that, without significant global emissions reductions, the flood risk in England will increase over the next 100 years" is sufficiently clear and concise to be appreciated by most of the population. There are also reasons to have greater confidence in probabilities that thresholds will be exceeded.

The problem of uncertainty

12. The second challenge noted above concerns situations in which firm probabilities are not available. The question here is deeper than how one would communicate them if they were available. To discuss this point, we need to outline briefly why probabilities may not be available, and we outline two ways of dealing with uncertainty/diversity in probabilistic estimates in the next two paragraphs.

13. One way of assessing some of the uncertainty is to allow the initial values entered into a particular model, and the parameters in the model, for each simulation, to be taken from distributions of values. Once a sufficiently large number (an "ensemble") of forecasts has been produced, the proportion of those forecasts

having some characteristic, such as showing a temperature increase of two degrees or more, is sometimes treated as an *estimate* of the probability of that characteristic at whatever horizon for which the forecasts were made. (Significantly, more effective methods than simple counting are used in practice.)

14. For some variables, predictions from different climate models diverge considerably but, for other variables, there is greater consistency across such a "multi-model ensemble". The language of "confidence" is more appropriate for expressing the difference in degree of uncertainty when model forecasts are in conflict; the probability that each individual model forecast is believed realistic is also of value. Importantly, it is simply not the case that these ensembles encapsulate all types of uncertainty involved in forecasts. Thus, they provide at best incomplete estimates of probabilities for the outcomes of interest under clearly vetted conditions and, at worst, excuses for false confidence. While they may be a more reliable guide than pure judgment, just how good a guide they are remains an issue of debate, even in the case of seasonal forecasting (and, of course, we can have no relevant empirical evidence in climate forecasting on which to assess them).

15. The process of model-building starts with the most robust and familiar aspects of the problem under consideration and then develops over time to incorporate more and more of the less-well-understood effects. It is therefore plausible that, as models become more advanced and more detailed information is expected of their output, the diversity of outcomes increase. Levels of uncertainty will appear to increase if we have not allowed for, or worse, have suppressed, likely shortcomings in today's models.

16. There is a spectrum of confidence in climate predictions. These range from the globally-averaged quantities in which we have reasonable confidence, to regional impacts for which we have a very high level of uncertainty, all hinging on the assumption the models have high fidelity. Initial value ensembles and perturbed parameter ensembles show us the diversity in current model behaviour. Multi-model ensembles such as the IPCC use also help us to understand possible dependence of results on model structure, but the number and independence of these models are very limited and the IPCC itself does not interpret the ensembles to reflect the probable range of reality even for global mean temperature. Thus, we should not communicate the diversity of model simulations as if it were the uncertainty in our future, unless we believe that diversity reflects a probability that genuinely provides a basis for action; this is not the case for today's models. We can, however, say that we have more confidence in results which are common to all model structures, while noting that the fact these models share known common errors limits our ability to quantify this increased confidence. In such cases, we need to inform the public of our confidence in the scientific results, not just the uncertainty from today's modelling experiments. How should this be done?

17. For the IPCC fifth assessment report, lead authors are told that: "confidence should not be interpreted probabilistically" (page 3). Instead, it should reflect the type, amount, quality and consistency of evidence and the extent to which different experts agree on it. These should be assessed and used to assign confidence into one of five categories (very low, low, medium, high, very high).

18. Although criteria for correct assignments are suggested, it is clear that confidence assessment is a highly subjective process, reflecting the subjective nature of the uncertainty itself. In other words, the uncertainty that we have is concerned with our own lack of knowledge about the system, not a property of the system itself. There are two levels of this uncertainty: the uncertainty reflected in the diversity of our current models, and the chance that, for a particular time and forecast, our current models are (un)able to provide realistic simulations at all. Our confidence assessments need to reflect both of these.

Recommendations

19. To increase public trust in the results of climate science, we recommend that the uncertainties inherent in climate forecasts be made publicly explicit and discussed openly.

20. In cases where climate scientists consider that these uncertainties can be legitimately expressed as probabilities, we suggest that use of a dual verbal/numerical format for expressing uncertainty (eg, "likely (65–80%)").

21. In addition to that, or as the sole measure in cases where climate scientists consider that the uncertainties cannot be legitimately expressed as probabilities, we propose that the verbal scale developed by the Intergovernmental Panel on Climate Change for their Fifth Assessment Report is used to communicate confidence in forecasts and the science underlying them.

22. Greater public trust in results of climate science is more likely to develop if the public understand better the processes of scientific research and the use of computer models in such endeavours; in particular the characteristics of different types of uncertainty in climate science. We recommend that the media give greater attention to this issue, more clearly distinguishing what is near certain and what is uncertain and likely to change; as well as how the two can live side by side in the same field of scientific research without contradiction.

April 2013

Written evidence submitted by ADS (CLC020)

About ADS

ADS is the trade organisation advancing the UK Aerospace, Defence, and Security industries with Farnborough International Limited that runs the Farnborough International Airshow, a wholly-owned subsidiary. ADS encompasses the British Aviation Group (BAG) and jointly sponsors, with Intellect, UK space. ADS is also a member of the Sustainable Aviation coalition of airports, airlines, aerospace manufacturers and NATS.

ADS was formed on 1 October 2009 from the merger of the Society of British Aerospace Companies (SBAC), the Defence Manufacturers Association (DMA) and the Association of Police and Public Security Suppliers (APPSS). ADS comprises around 900 member companies within the industries it represents. Together with its regional partners, ADS represents over 2,600 companies across the UK supply chain.

The Aviation sector is vital to the UK economy bringing financial benefits to the UK and providing high skilled employment and connections to growing markets. The UK aerospace industry is one of the UK's few world class manufacturing industries worth over £24 billion to the UK of which 75% is exported world-wide. The sector is high value and highly skilled, employing directly and supporting a workforce of around 360,000 plus another 46,000 overseas. As the Prime Minister noted UK aerospace is "a powerhouse in the UK economy".

ADS welcomes the opportunity to respond to the consultation from the House of Commons Science and Technology Select Committee. Representing the aerospace supply chain, the ADS submission focuses on how aerospace manufacturers can contribute to the public's understanding of climate change.

1. *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

1.1 It is important that Government Departments utilise the knowledge and expertise of scientific advisors. Impartial advisors can better help inform the public discourse on climate change. ADS welcomed the appointment of a Chief Scientific Adviser HM Treasury in June 2011 and the increasing community of scientific advisers in Whitehall departments has been well received by industry. These appointments allow longer-term strategic thinking with regard to science and engineering investment and ensure that expert scientific advice is available within departments and across government.

1.2 Industry takes its environmental responsibilities seriously and over recent years, huge technological strides have been made to reduce emissions. As a result of continuous technological advancement, an aircraft today produces 70% less carbon dioxide compared to its equivalent from 50 years ago and 75% less noise than its equivalent from 30 years ago. The new Airbus A380 burns 17% less fuel per seat and produces around 10% less NOx than the previous largest aircraft model, whilst creating only about a quarter of the noise on arrival. Boeing's new 787 Dreamliner is 20% more fuel efficient than other aeroplanes of similar size partly as a result of being made from light carbon composite materials and having world-class Rolls-Royce engines.

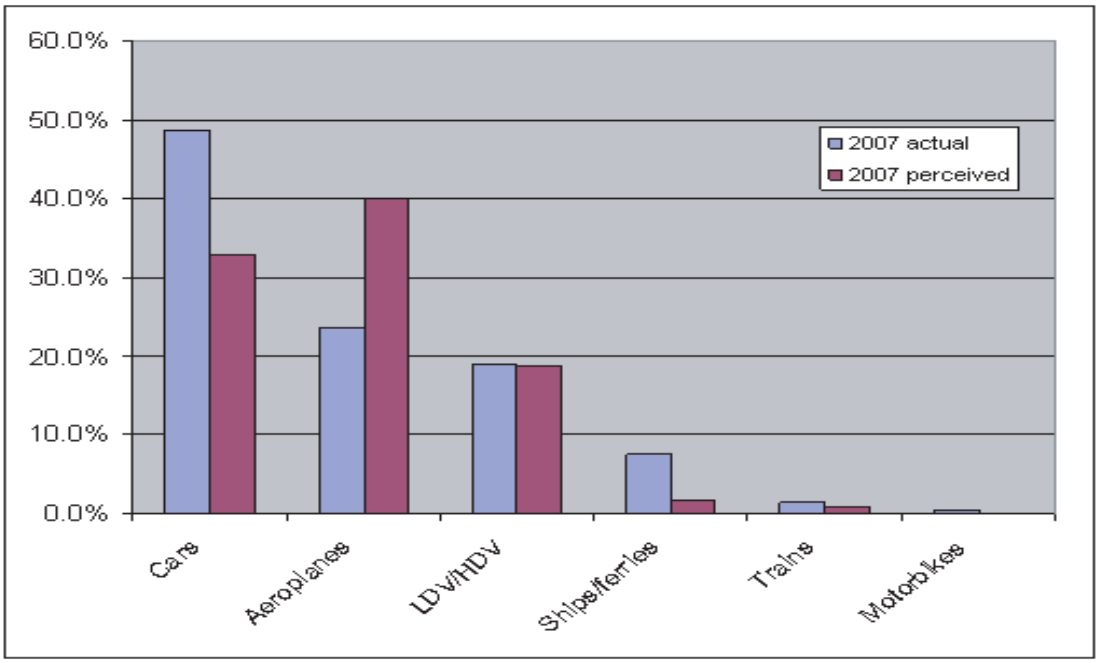
1.3 With technological innovation playing such a crucial role in enhancing environmental efficiency, it is important industry has a voice within public discourse on climate change. Many companies in the aerospace industry facilitate or are involved in events and initiatives that inform the public of the new technologies and efficiencies that are reducing the environmental impact of flying.

- Futures Day, to which 7,500 children attended, and the Public Weekend at the 2012 Farnborough International Airshow. The information available and the Airshow itself are valuable in demonstrating to the public the huge progress and technological strides the industry has made over the past 40 years.
- "See Inside Manufacturing", launched by Business Secretary Rt. Hon Vince Cable MP is a joint initiative between the Department of Business, Innovation and Skills and industry. The Scheme has been useful in informing young people about the aerospace industry and the career opportunities it provides. In June 2012 the aerospace industry in coordination with the defence industry hosted over 60 showcase events and activities concerning Science, Technology, Engineering and Mathematics (STEM).
- A number of individual company initiatives such as:
  - Future by Airbus, which promotes out-of-the-box thinking to meet eco-efficiency goals through innovation. Under this initiative Smarter Skies was published, Airbus's 2050 vision.
  - Rolls-Royce's "How a Jet Engine Works" programme and The Big Bang—Young Scientist event, which both promote Science, Technology, Engineering and Maths to young people.

1.4 There is still more that the aerospace industry (in cooperation with Government) can do to communicate with the public so the discourse surrounding climate change is well informed. The industry is not complacent and always looks at ways to inform the public of its efforts to reduce the environmental impact of its activity and the many scientific advancements within aviation.

2. *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

2.1 It is important that the public understanding of the factors affecting climate change are informed by scientific evidence; and that Government policy is targeted to ensure maximum environmental benefits with the minimum impact on business competitiveness. Studies have demonstrated that the public understanding of the environmental impact of aerospace does not reflect reality. The graph below using information from the DfT's report on "Public attitudes to climate change and the impact of transport" and the National Air Emissions Inventory, gives evidence of this point, through a comparison between the real share of transport emissions and the perceived share.



NB total transport emissions (100% in the chart below) represent only 27% of the UK total in 2007.

2.2 The 2007 comparison, taken even before the introduction of fuel efficient Long Range Aircraft such as the A380 that are dramatically reducing fuel consumption per passenger mile, highlights each mode of transport's share of emissions in reality and what the public perceive them to be. The largest divergence is in relation to air travel where the public perceive emissions to be higher than evidence would suggest. The graph notes that the public perceived that flights accounted for 40% of total transport emissions whereas in reality it was almost half this amount.

2.3 It is clear from the above graph that more can be done to inform the public understanding of the factors affecting climate change. The government, industry and media all have a role in influencing this understanding. Industry is working to improve public knowledge of climate change issues with events such as Future Days at Farnborough Airshow, but also with joint industry initiatives. Sustainable Aviation (SA), for example is a proactive group of UK airlines, airports, engine and airframe manufacturers and NATS, established specifically to address sustainability issues. Through studies such as the CO_2 Road-Map, SA outlines an expert industry and scientific insight on how UK aviation can promote cleaner, quieter, smarter flying. The group not only addresses carbon emissions but other areas of importance to the public such as noise, sustainable fuels and waste reduction, etc.

2.4 The media has the potential to play a positive role providing access to informed data and information, as well as highlighting and raising climate change concerns in the public consciences. It can also help inform the public of technological and operational improvements within industry that are reducing the environmental footprint of aviation.

3. *How important is public understanding in developing effective climate change policy?*

3.1 A recent report by Frontier Economics prepared for Heathrow[38] noted that companies do 20 times the amount of business with countries connected by air, than those who are not. Supporting aviation will benefit the wider economy. Ineffective climate change policy can result in hindering the aviation industry, general business and international competitiveness. Taxation such as the Air Passenger Duty has resulted in the UK ranking 134th out of 138 countries in terms of competitive aviation by the World Economic Forum. This

[38] Frontier Economics "Connecting for growth: the role of Britain's hub airport in economic recovery" http://www.frontier-economics.com/library/publications/Connecting%20for%20growth.pdf , Frontier Economics, September 2011 , last accessed 28/03/12

damages the industry and the UK as a place to do business. In a report published by PWC in February 2013 abolishing APD would boost UK GDP, create jobs, benefit consumers, tourists and business, and potentially pay for itself.[39] For these reasons it is crucial that climate change policy is effective and does not hinder the UK economy.

3.2 The public's understanding of climate change, particularly channelled through environmental pressure groups undoubtedly has an effect on the formulation of climate change policies. Good public understanding of the aerospace industry and how key technologies are reducing environmental impact of flying are important to influence views on the necessary climate change policies. As highlighted above, poorly targeted environmental policy risks the UK's global competitiveness in the aerospace industry and the economy more widely. They also have the potential to divert funds away from industry hindering the ability to invest in innovative new technologies. It is therefore important that public knowledge of the factors affecting climate change is well informed.

4. *Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policy policies?*

4.1 The public's perception of environmental changes is complex and as a result cannot always translate into clear and feasible public policies. Although concerning noise, rather than climate change issues, the imminent Noise Road Map commissioned by Sustainable Aviation, gives evidence to this point. It states that despite the reduction in aircraft noise achieved by the industry over the last half century, "perceptions of noise by local communities have not always improved in line with these improvements". There are a number of variables to be considered and behaviour is not easily predicted.[40]

4.2 The difficulty in interpreting the public understanding of aviation and climate change is equally as difficult. As outlined earlier, perception does not match reality and opinions and actions are often complex and unexpected. Evidence of this point can be seen in the 2011 Office of National Statistics Opinion Survey. Respondents were asked whether they supported increased taxes/other charges to encourage reduction in air travel. Over half (54%) did not support this notion with only 19% supporting that premise. Even among those who classed themselves as very concerned about climate change there was net opposition to this measure.[41] The public, who are often worried about the impact of climate change, are frequently not supporting of certain environmental policies. It is a complex arrangement, Government must be aware of this when developing relevant public policy policies.

4.3 To aid public understanding on climate change, government messages should be consistent. Mixed messages enhance the complexity of the public perception of environmental issues. These mixed messages appear when industry is supported, while at the same time penalised. The Air Passenger Duty is a clear example of this. While the government outwardly supports the aviation industry and encourages innovation, they continue to increase the Air Passenger Tax beyond any rising environmental impact of flying. This exacerbates negative perception towards the industry and reduces the amount of money available to reinvest in the new, more fuel efficient, types being developed through fleet replacement. It is crucial Government has a clear position in order not to create confusion amongst the public and wrongly influence opinions and behaviour.

5. *Can lessons about public engagement with climate change policy be learned from other countries?*

5.1 Acting internationally and learning from successful and unsuccessful policy from other countries is crucial when addressing issues domestically. "Going it alone" risks international competitiveness and will put the UK at an economic disadvantage. In addition, effective climate change policy is enhanced greatly from the involvement of international partners. Aviation operates in a global market and as such, needs global solutions to avoid market distortions that would prejudice UK industry.

5.2 Acting internationally enhances environmental performance, and has a much greater impact than domestic initiative. For example, in the case of aircraft and aero-engine design, standards set at the international level have significantly enhanced environmental performance. The UK Government's role in the negotiation and development of these at the International Civil Aviation Organisation (ICAO) has been fundamental in ensuring that UK industry is not disadvantaged by other nation's interests. The aircraft CO2 certification scheme under development at ICAO and supported by industry gives a key indication of the importance of environmental action on an international level.

5.3 Learning from the lead taken by other countries is important when formulating effective environmental policy. In the case of Air Passenger Duty, other European countries, acted quickly when it was realised the tax was having a negative impact on their respective economies. The Netherlands, Denmark and Eire have all reversed equivalent taxes in recent years, while the Irish government has reduced it significantly. The UK government has already recognised the negative impact Air Passenger Duty had in Northern Ireland and has

[39] PWC "The economic impact of Air Passenger Duty" , February 2013, last accessed 10/04/2013

[40] Sustainable Aviation ' Noise Road Map: A blueprint for managing noise from aviation sources to 2050, April 2013, last accessed 08/04/2013

[41] Public attitudes to climate change and the impact of transport in 2011, published 26 Jan 2012, Department of Transport accessed 05/04/13

reduced it there in order to compete with flights from the Irish Republic. Climate Change policies must support environmental goals effectively, not hinder the economy or industry.

6. *Conclusion*

6.1 The UK Aerospace industry sector is a successful, high value, high technology engineering, manufacturing and service industry that generate significant returns to all its stakeholders. UK Aerospace is investing in new technologies to reduce its environmental impact whilst working with Government to secure the future of the industry. The industry does work to communicate its activities in reducing its environmental impact, but is not complacent and is ready to do more. ADS, and its members, would be pleased to work with Government to enhance public knowledge of climate change.

April 2013

Written evidence submitted by the Tyndall Centre for Climate Change Research (CLC021)

This submission presents research on three topics relevant to the inquiry, namely; i) discussions with members of the public about novel and unfamiliar climate change mitigation technologies, ii) research into social dilemma theory suggesting that particular aspects of knowledge about climate change are key, and iii) the study of local energy developments which bring climate change discourse into peoples' everyday lives. Our conclusions drawn from these research areas are structured according to the questions specified in the terms of the inquiry rather than by topic.

(i) *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

1. In the last decade, researchers at the Tyndall Centre have conducted a series of studies into public perceptions of low carbon technologies of various sorts and by association climate science, climate policy and energy policy. Data from focus group studies on public perceptions of Carbon Capture and Storage (CCS) suggests that information concerning CCS (eg risks, uncertainties) provided by industry and government is less trusted than that provided by academics. Where information concerns new technology that is unfamiliar, social trust is important, thus people make an assessment of the technology based on their assessment of the person providing them with that information (Roberts and Mander, 2012).

2. Further, our research on CCS indicates that members of the public question the motivation of organisations involved in a particular technology, and that this influences their acceptance. For example, if an initiative is driven by the Government or other public body, claims that its primary purpose is to reduce environmental impact are better received than equivalent claims by a private sector organisation where members of the public consider the financial benefits that the organisation may receive. Our focus group work, as well as that presented by Terwel et al. (2009), supports this conclusion.

(ii) *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

3. The media certainly has a positive role to play in public understanding, and our research on CCS suggests that individuals become informed about issues via a variety of sources including internet, print and broadcast media.

4. Lay "publics", we use a plural do denote heterogeneity of perspective and circumstances within the populous, are aware of bias and sensationalism in the media and are unlikely to change or form opinions as a result of single article. However, it is critical that media articles are accurate when reporting scientific issues; content analysis of articles referring to CCS suggests scope for improvement in this area, with 18% of articles, focussing on CCS, reviewed over a three year period containing incorrect or inaccurate information about CCS technology.

5. Articles in the media may focus on conflict and disagreement amongst scientists which can distort perceptions of uncertainty and consensus. Presenting arguments from both proponents and opponents of an issue, whilst providing a sense that an article is balanced, may leave the public unsure of the potential implications of climate change (or an emerging technology) and can maintain a media focus on events over and above the science (see also Allan, 2002; Nelkin, 1995).

(iii) *How important is public understanding in developing effective climate change policy?*

6. Public understanding is central to building support for climate policy. Both demand and supply side approaches to emissions reduction require acceptance, as a minimum, of the need for the intervention, and in some cases action throughout the population. Research shows that this can only be achieved when individuals understand and agree with the rationale for particular measures.

7. Low public acceptance makes new policies politically unfeasible in a democracy (Gärling & Schuitema, 2007) and low public acceptance also tends to reduce the effectiveness of implemented policy measures. Opposition and controversy surrounding interventions to reduce emissions, whether they be infrastructure projects or other policy initiatives, can prevent implementation (Roberts et al, 2012). There are many factors which can help to reduce the likelihood of opposition forming but open, transparent and reflexive engagement are crucial (Mander and Mclachlan, 2013).

8. Social dilemma theory offers valuable insights into how the acceptance of climate change policies amongst members of the public might be increased (Hardin, 1968; Ostrom, 1990; Yamagishi, 1992). Specifically social dilemma theory offers a guideline on the sort of understanding and knowledge about climate change that is required to create acceptance for climate change policies.

9. Climate change policies, that do not rely on positive incentives (so called pull measures like subsidies, making low emission behaviour more convenient), face low public acceptance (Cherry, Kallbekken, & Kroll, 2012; de Groot & Schuitema, 2012). Such measures (eg taxes, punishments, restrictions) decrease the immediate personal benefits of individuals, or are seen as restricting individual freedom. Social dilemma theory (Ostrom, 1990; Yamagishi, 1992) suggests that if people are aware of the collective nature of the climate change problem, they will not only be more likely to accept climate change policies, but may go as far as demanding these policies. By recognising the collective nature of the problem, the public will be more likely to see the necessity for climate change policies and consequently be more accepting of them. Research suggests that the following knowledge about climate change is particularly relevant to perceiving the necessity for climate change policies.

(a) If the collective, long-term cost of climate change is not well understood then many mitigation policies will not seem rational. Knowledge that climate change will, in various ways, affect everyone on Earth and future generations is therefore important (Staats, Wit, & Midden, 1996).

(b) Recognition amongst members of the public that mutual mitigation efforts, ie collective action, are needed for successful mitigation. The strategy to promote individual action is different from the strategy to promote the acceptance of climate change policies. When individual actions are targeted, campaigns often emphasize that personal mitigation efforts are significant and will make a difference. In order to approve of climate change policies people need to be aware of the fact that only mutual and not singular mitigation efforts are significant. However, this type of knowledge can give rise to feelings of international disempowerment; arguments presented in the style of "But they're not doing anything in the USA...". Conversely, Horton and Doron (2011) suggest that this reaction is equally powerful *within* a nation state. Because everyone will be affected by the collective cost and thus everyone will profit from avoiding the collective cost, it is only fair that everyone contributes to mitigation efforts, and by implication, that no one free-rides on others" efforts. This fairness notion, engendered by understanding the nature of climate change, may be a powerful tool for policy justification

10. From knowledge about the collective cost of climate change and the necessity of collective action to avoid this cost, it follows that national climate change policies are necessary to ensure that "everyone does his or her bit". Policies that embody a notion of fairness help to reassure various publics that no one will free-ride and reduce the sense for those participating in action that they are being taken advantage of (Hardin, 1968).

11. Social dilemma theory therefore suggests that an *in-depth* knowledge of the climate change science by publics is not required. More important is an understanding of the collective nature of the problem. It is not suggested that there will be active movements to embrace restrictive policies, but empirical research on low emission behaviour demonstrates the potential for acceptance to be increased by a perception of necessity (Horton & Doron, 2011; Line, Chatterjee, & Lyons, 2010).

(iv) *What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?*

12. Whilst it is certainly important to consider how public communication on climate change could be improved, it is also important to consider where scientific arguments are *already* being used, not always to positive effect on public support for climate change related measures.

13. It is apparent that climate change and energy do not rank highly in terms of salient issues in most people's daily lives in the UK (Whitmarsh and Upham, 2013). Whilst perceived geographical and temporal distance of climate change impacts are widely acknowledged as a barrier to public engagement with climate change (Spence et al., 2012), case studies of low carbon energy developments (eg a local wind farm) indicate that it is through such localised controversies that climate change can be "made real" for local publics and where the science of climate change is discussed, interpreted, assessed and utilised. This distant and abstract set of concepts is cited by supporters and protestors, features in local news stories, and is mentioned within social and familial circles (Roberts et al., 2013).

14. Whilst these local controversies offer a potential focused point at which a particular "public" or "publics" may become more responsive to communications relating to climate change, the issues of trust in sources, intelligibility and relevance remain. In addition, this is a particularly challenging environment within which to communicate the science of climate change as it may already be highly charged. Most often, arguments around

the necessity and urgency of climate change mitigation measures are cited by supporters of low carbon technology development. Therefore, in this context, climate change science can become part of a controversy where it is seen as being strongly aligned against desires to protect a sense of place, landscape, or local economy. In other cases, climate change is deployed by opponents who argue that a particular development is not an appropriate response to the problem. (McLachlan, 2009b).

15. This context gives additional weight to increasing calls from academics to abandon adversarial and pejorative terms such as "NIMBY" in these cases and instead engage with the conditionality of the opposition to a develop measures to improve communication and reduce the impacts that are of concern (Bell et al., 2005, Devine-Wright, 2005, Devine-Wright, 2009, Burningham, 2000). When such developments are a "battle" then "climate change" can be used as a weapon—such approaches are unlikely to assist in developing public understanding and support for mitigation policies.

16. The potentially altruistic nature of climate change mitigation actions, ie where measures are promoted to the public in terms of "doing the right thing" rather than saving money, also relates to low carbon energy controversies. In these cases, the fact that local residents will not see a reduction in their energy bill is often a source of contention and sits at odd with efforts to build symbolic ownership of local development, for instance through figures on numbers of local homes that will be supplied (McLachlan, 2009a). Again, in this context it is possible that "climate change" becomes seen as something that is used by those who directly benefit from schemes to marginalise those who do not.

(v) *Can lessons about public engagement with climate change policy be learned from other countries?*

17. There are a number of lessons that can be taken from the proposed CCS development at Barendrecht in the Netherlands, which was eventually cancelled amid strong long opposition (eg see (Brunsting et al. 2011). This case illustrates the importance of support from local government bodies and engagement with key public opinion formers as early as possible. At Barendrecht, residents felt that everything had already been decided, there was no consultation process and as such they felt they had little say in their local environment.

18. There are many examples of guidelines and recommendations for general public engagement processes available. However, certain key features can be highlighted in relation to specific climate change mitigation developments:

(a) Understand and adapt to the local community context and the diversity of interests and cultural values within it (see Ashworth et al. 2011, Ashworth 2009, WRI 2008);

(b) Consider trust in the sources and providers of information, in the organisations involved and in the regulatory processes governing the development;

(c) Involve a variety of stakeholders, professional and lay, throughout the project in such a way that they feel empowered to have voice in an open and transparent communication and engagement process. As well as explaining the details of what the project entails, this should present information explaining the reason for the development, the choice of location, the associated risks and benefits (see also Hammond and Shackley (2010));

(d) Include appropriate technical information in communications materials;

(e) Tailor information and communication processes to meet the needs of different stakeholders or individuals and including informal communications networks where appropriate (Itaoka et al. 2012, Ashworth 2009);

(f) Involve different trusted organisations (such as NGOs), for example in the development of communication materials or at other points in the process, to deliver benefits in terms of both widening the discussion and presenting a broader support base for the development (Ashworth et al. 2009; Deutschke 2011).

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April 2013

Written evidence submitted by Plymouth Marine Laboratory (PML) (CLC022)

1. Plymouth Marine Laboratory is a world-class, independent research laboratory engaged in marine environmental research across a wide range of topics of interest and relevance to society. Especially pertinent to the Inquiry are PML's investigations into a variety of carbon dioxide ($CO_{2)}$ related phenomena including ocean acidification (OA)—often referred to as climate change's evil twin. A key thrust of PML's interdisciplinary science is researching the combined impacts of all CO_2 related impacts; it is becoming obvious that the impacts of OA vary with rising temperatures resulting from climate change (CC). The combined impacts of OA and CC on the marine environment which affect many groups of organisms have potentially significant and worrying consequences including disruption of ocean food webs which in turn will affect many marine organisms as well as the food supply of a large proportion of the global human population. Thus PML has a direct interest in studying climate change, but especially when it combines with other CO_2 phenomena.

2. This evidence is submitted by Plymouth Marine Laboratory based upon its experience in engaging with a wider public as part of its charitable objectives, and as a result of its involvement in a number of climate change related research topics. PML remains at the vanguard of global investigations into the "double-trouble" of OA and CC through national and international research programmes including: The UK Ocean Acidification Research Programme (UKOA), The European Project on Ocean Acidification (EPOCA), and Mediterranean Sea Acidification in a Changing Climate (MedSeA), amongst others. Apart from working at the "sharp end" of discovery through laboratory and "in situ" investigations, the use of remote sensing imagery obtained from satellites and sophisticated predictive computer modelling, PML is also involved in delivering knowledge exchange, providing this service for, amongst other projects the NERC, Defra, DECC funded UKOA project. Additionally PML is a major partner in the EC-funded ECO2 Project which is investigating sub-seabed storage of CO_2 as a climate change mitigation strategy, and its potential impacts on the marine environment, including looking into "best practice", with involvement in the scientific but also the public perception workpackages. PML has gathered a unique multi-disciplinary team of individuals to its socio-economic group which investigates the value of marine goods and services and how they may be impacted in a changing climate—perception of risk, itself determined by knowledge of the likely consequences of climate change, is a key part of these investigations. Inevitably PML collaborates across a wide geographical area with a broad range of organisations ie UNEP, UK Met Office etc.

Relevant PML Outputs

3. Apart from its impressive scientific publication record, including many peer reviewed articles around the subject of CO_2 and ocean acidification, PML has also been involved in the production of a range of materials and participated in many activities for a wider public consumption:

4. As part of the EPOCA Project PML instigated and was a major contributor to various publications including: "Frequently asked questions about ocean acidification"; "Ocean acidification, questions answered"; "Ocean acidification: the knowledge base"—all intended to provide accessible, factual information about OA to a wide stakeholder community.

Audiences for Engagement and Public Understanding

5. The general public is not a single group but an amalgam of differing interests and experiences, as such there is no one-size-fits-all approach to science communication and any attempt at sharing understanding of a topic requires a targeted approach. However there is an overarching need to ensure a consistency of information, albeit in different ways at different levels, so that differing groups are encouraged to "speak the same language" to avoid confusion, misinformation and misinterpretation. To this end PML (funded by NERC) produced a DVD "Ocean acidification; Connecting science, industry, policy and public".[42]

6. One particular group is young people—the generation that will inherit the benefits or otherwise of our actions today. This younger generation is key to any future understanding of CO_2 related challenges and mitigation/adaptation strategies. In recognition of this PML has produced a short film through working with a local school. The film, "The other CO_2 problem", was researched, written, designed, acted, animated and filmed by the students themselves for their own peer group—many thousands of copies have been requested and yet more have been downloaded.[43]

7. A recent initiative is the PML "Coffee Break Science" series of short podcasts, which has been developed and the first has been created with funding support from NERC.[44] This series is intended to introduce PML research topics at a level which is accessible to a wide audience. In a few minutes each researcher will explain their topics themselves in layman's terms so providing bite-sized science, an introduction to the researchers as real people, while helping to bridge the gap between researcher and the public.

8. A very practical example of public engagement which resulted in a positive outcome was carried out as part of an experiment within a Scottish loch, which simulated the leakage of CO_2 in the marine environment.

[42] http://www.youtube.com/watch?v=_BPS8ctVW2s

[43] The film is available at http://www.youtube.com/watch?v=_BPS8ctVW2s; it has been translated into other languages including Portuguese, German and Italian.

[44] http://www.youtube.com/watch?v=4uak0vVGgGY

Information, including posters, was provided to explain the experiment to the public and to alleviate any fears so ensuring acceptance of the experiment before it happened.

9. PML remains active in encouraging its scientists to engage with students at local events as part of the British Science Association National Science & Engineering Week and through visiting schools as STEM Ambassadors to share their knowledge and enthusiasm for science, often focusing on climate change and related topics. This is an especially effective means of building trust; the students get to see that scientists are ordinary human beings—approachable, credible and with integrity. Such events also provide the ideal opportunity to "meet" the public and to hear directly their concerns and misunderstandings and to exchange, in addition to simply providing knowledge.

What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?

10. PML does not actively become involved in seeking public perception data concerning climate change, although through contact with a wide range of organisations it does have the opportunity to make some observations. PML has a strong socio-economic research group which has carried out face to face interviews with members of the public on CC-related topics, and topics where some knowledge (acceptance or otherwise) of CC underpins responses.

11. There is little doubt that CC understanding has grown in recent years although it does appear to fluctuate around the 40% acceptance mark, but there remain a number of barriers to further engagement which have the potential to delay concern and action. For many people the subject is still too inaccessible, too far into the future and too far away, geographically, to worry about. Anecdotal feedback suggests that the "public" often think that climate change cannot be happening because of the reluctance of scientists to highlight single events as CC-caused, or because of the perceived reluctance of governments to take significant action.

12. In more detail there is still confusion between climate and weather. There appears to be a sense of resignation that even if CC is understood that there is little that the individual can do—it is too big to make a difference—in which case "the government will pay the scientists to sort it out". There is also the feeling that "what is the point if China keeps building new coal fired power stations". A slightly more cynical but still real perception amongst some is that climate change is being used as an opportunity to "tax" people, or to keep scientists in a job. In short there is still confusion of message, consequences, remedial actions and relevance to the individual. This is further exacerbated by a confusion of motive on behalf of those who should be leading (government, scientists).

Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?

13. Whilst the "climategate" incident dented public trust in the short-term, there is still a reliance upon scientists for information. Trust is a commodity hard gained and easily lost—another reason for the reluctance of scientists to become embroiled in "public engagement". Lessons can be learned from other branches of science, which whilst not so potentially worrying are none-the-less complex and difficult to understand. "Champions" have proved of considerable worth: Sir David Attenborough is the perfect example of someone who can "carry a crowd" and who has recently begun to draw attention to how climate and other changes are impacting the natural environment he has encouraged us all to care for. Brian Cox, is a fine example of how a personality, and a down-to-earth approach, can suddenly make a generation of TV viewers keen to soak up astrophysics, to such an extent that there is still a hunger from the media and public for a diet of largely inaccessible physics! The press and media are hugely influential and when combined with such champions can change attitudes. Climate change requires such a media friendly champion.

14. PML has engaged with a wide cross section of the "public" through special events in the House of Lords and the House of Commons for policy makers and business leaders; across the wide swathe of public to primary school children through Science Ambassadors; video and popular articles on CO_2 related phenomena and many web-based "offerings" are part of PML's arsenal for communicating science to the broadest possible audiences. Each segment of society has its own level of understanding, particular vested interest, and base level of understanding so a range of approaches are necessary if the "message is to get through"; what works for one group will not necessarily work for another. Essential is a consistency of message across all strata of society to avoid confusion, this requires a coordinated approach across the organisations and institutes engaged in CC communications, to provide clear, accurate information to all outlets but especially the press and media.

How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?

15. It is apparent that any materials produced to encourage acceptance of CC as fact need to be tailored to individual audience sectors—there is no "one size fits all". But whatever method is chosen there is a desire from the "public" to be given facts—what is going to happen, when will it happen, how will affect me, what can be done/can I do about it? Climate Change does not lend itself readily to such "hard" answers.

16. Undoubtedly the press and media are key in getting the messages across but they are as frustrated by the lack of certainty as to future consequences as are the general public. There is a feeling that there has been a swing away from the need to "balance" every pro-CC statement with an opposing point of view from the sceptics. This must have led the "public" to think that scientific opinion was also balanced, for and against, an interesting occurrence where "balance" creates an untruth.

17. Most public surveys reveal that people gain most of their information, and some opinion, from the media. As such the press and media have an enormous part to play in providing information, but as in all aspects, politics for example, each press or media outlet has its own agenda and "take" on events.

18. Part of the challenge is for the scientific community to provide indisputable stories which make direct links between events and causes when it comes to climate change. PML experience illustrates this fact with prominent environmental journalists becoming fatigued with the same old stories from a wide range of organisations, still lacking substance of impact and consequence of CC. The process of science is not geared (nor should it be) to providing major headlines, however there is a need for scientists to begin to recognise the potential public interest of their research. Scientists are often reluctant to engage with the media—often due to the idea that journalists will not understand the nuances of their science, or that the scientists simply mistrust the journalists to report fairly. These barriers still exist but with more specialist science journalism the understanding and trust has been growing. More recently specialist science communicators have begun to bridge the gap between scientists and journalists, ensuring journalists are given the best and most relevant information, while the scientists gain confidence that their science is being presented in the best possible way. PML has been active in creating a communications group charged with just such aims.

How important is public understanding in developing effective climate change policy? What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?

19. There is no doubt that a belief in climate change is essential if mitigation strategies for reducing carbon dioxide are to be supported across a wider public. All such mitigation measures will cost money, which will either directly affect the public through increased energy bills, or indirectly through centralised taxation. If climate change is not real then there is no reason to pursue these other technologies. Evidence of this was obtained at two focus groups carried out as part of the ECO2 project, where both science journalists and science communication students voiced this as a major challenge (as yet unpublished).

20. Where there are potential personal sacrifices such as not driving a car so often, or facing an increased electricity bill to help fund renewable energies, a broad understanding of the underlying drivers is essential. Thus if the public are expected to tolerate such sacrifices they will demand to know why they are being asked to do so. Again this will require some concrete examples that are likely to affect their lives or the lives of their children. The PML film, "Ocean acidification: connecting science", went some way to addressing the need for clear accessible information, but the requirement for more widespread pertinent information (not propaganda) remains.

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Written evidence submitted by The James Hutton Institute (CLC023)

The James Hutton Institute welcomes the opportunity to provide views to the UK Parliament on the public understanding of climate change and its policy implications. The Institute was formed on 1st April 2011 when SCRI (Scottish Crop Research Institute) and the Macaulay Land Use Research Institute joined forces to create one of the world's leading scientific organisations focusing on people, land, crops, water and the environment. The Institute has a significant programme of inter-disciplinary research (including social sciences) on climate change as it relates to food, water security, and provision of ecosystem services. Staff at the Institute have coordinated and been partners in research projects looking at all aspects of climate change for funders including policy makers such as the Scottish Government and the EU.

This response is based on research undertaken by the James Hutton Institute, partners and in the broader literature, from natural and social scientists working on different aspects of climate change including mitigation, adaptation, and significance, risk and uncertainty.

SUMMARY OF RESPONSES

- Climate change is seen as a serious issue but there is still considerable misunderstanding as to the concept and science behind it.
- Perceptions are fluid and influenced by multiple sources.
- Scepticism can be reduced and public understanding improved by better information on the causes and consequences of climate change.
    - Communication on climate change needs to be placed into the context of people's beliefs in order to influence behaviours.
    - The media has a significant role to play in presenting a consensus perspective rather than polarised views (but in reality the media are often willing to give air to eccentric opinions).

- — Barriers to improved understanding can be overcome by consistent clear messages.
- — Bodies such as respected NGOs are seen as reliable sources of information

— Engagement with the public and stakeholders is a viable approach to develop consensus and successful policies.

- — It is likely that promoting behaviour change based on cost effectiveness is more beneficial than using scientific justifications.

— There is a need to expand the debate about climate change causes and solutions beyond energy and fossil fuels, to include ecosystem services (particularly climate regulation by soils and biodiversity), food and water security.

- — This may provide further motivation for behaviour change.

— There is need for greater integration of science disciplines and inter-government Departmental collaboration to address the multiple aspects of climate change.

— Much can be learned from studying other cases of public engagement to develop policies, to inform the development appropriate approaches concerning climate change.

Declaration of interest: The James Hutton Institute is a not-for-profit research institute and has no vested interests in matters arising from the responses provided.

1. *What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?*

Research undertaken by The James Hutton Institute, partners and in the broader literature shows that:

— 1.1 In general, the seriousness of climate change is broadly understood by the public, but not universally accepted (ie GILDED European Policy Brief 4, COST Action 2009, Walthall et al 2013).

— 1.2 Public understanding of climate change science may be becoming increasingly well understood, but this is not necessarily reflected in people's beliefs and behaviours (IPCC AR4 2007 and comments below).

- — 1.2.1 However, climate change as a concept and the way it affects people is poorly understood by the public, and is easily confused with other aspects of climate, such as the weather.
- — 1.2.2 Interviews with the public indicate that climate change is perceived as an abstract, scientific concept. To become more meaningful this concept needs to be translated into actions and images in relation to everyday life, eg anchoring the idea of climate change in the concept of air pollution, and the objectification of this idea as "smoking chimney stacks" or fumes from car exhausts. Such an approach translates climate change into a more concrete, tangible reality that people can relate to (GILDED 2012).
- — 1.2.3 However, this only addresses the perceived "visible" aspect of greenhouse gas emissions as pollution, not from sources like fertiliser applications and resultant N_2O (GHG and ozone depleting), which the public are generally unaware of.
- — 1.2.4 There is confusion in the terms of [anthropogenic] global warming and climate change.
- — 1.2.5 Public uncertainty about climate change may have remained stable between 2003 and 2008 but the extent to which people believed that climate change claims had been exaggerated doubled over that period (Whitmarsh 2011).
- — 1.2.6 Our belief is that, through media coverage (particularly of extreme events), there is a better understanding of the role of climate features, particularly the northern hemisphere polar jet stream, in influencing the weather.
- — 1.2.7 It is unclear how well the public understand the consequences of different levels of projected warming (ie 2°C, 4°C or 6°C) which would be better served by scenario examples, but we suspect understanding is rather weak.

— 1.3 The state of public understanding and associated beliefs is fluid and influenced by multiple factors and sources:

- — 1.3.1 Local weather is seen to be representative of global trends, with a disassociation between local weather conditions, anomalies elsewhere (ie cold winter of 2010–11 in UK and anomalous high temperatures in Canada, Greenland and Russia) and overall global trends.
- — 1.3.2 The LOCAW project has found that there are often large differences in the way people conceptualise environmental problems at home and at work. In part this is due to the differences in the social context and dynamics of home and work, but there are also important psychological mechanisms explaining this separation.
- — 1.3.3 Exposure to scientific information cannot entirely explain the levels of public concern; views on climate change are largely affected by the actions of political groups, including statements by political leaders (Brechin 2012), or occurrence of extreme events (ie Hurricane Sandy in 2012).

- 1.3.4 People whose livelihoods have a direct relationship with the climate (ie farmers, foresters, recreation/tourism) are more perceptive of observed changes and likely to undertake changes in behaviour in order to adapt (Matthews et al 2007, Matthews et al 2008, McCrum 2009).
  - 1.3.4.1 Such stakeholders can cope with significant complexity (McCrum et al. 2009) but need to be "stepped into" the issues of utilising climate change projections (to inform adaptation options) in a structured way that increases their confidence and enhances the credibility of the projections.
- 1.4 There appears to be a disconnection between perceptions of risk and understanding of the current rate of greenhouse gas emissions, ie risk of exceeding the 2°C warming limit and 2012 CO_2 emissions being 58% greater than 1990 levels (Peters et al 2013), and how consumption based economies drive this.
  - 1.4.1 It is likely that there is a lack of awareness of the issue of energy and resource use intensity and extent, ie we may use energy more efficiently but overall use more of it overall (Jevons' Paradox: the proposition that technological progress that increases the efficiency with which a resource is used tends to increase (rather than decrease) the rate of consumption of that resource) (SMILE 2011).
- 1.5 Public perception focuses on climate change being associated with energy and fossil fuel consumption only in releasing greenhouse gases (responses limited to things like tree-planting concerning carbon sequestration efforts (Nijnik et al., 2009; Slee et al., 2012)), with little connection made to the GHG consequences from loss of biodiversity, deforestation, degrading ecosystem services (particularly climate regulation and decreasing carbon sink capacity) and ocean acidification (Trumper et al 2009, Nijnik and Halder, 2012; Dyer and Nijnik, in press).
  - 1.5.1 There is an absence of awareness by the public on key issues of biodiversity and ecosystem functions, their degrading state and consequences on their essential role in climate regulation or potential as the basis for climate change mitigation and adaptation (UNEP 2011a, b).
  - 1.5.2 Similarly there is confusion between the relationships between GHG emissions, climate change and food security (ie risks to productivity from impacts, nitrous oxide and methane emissions from agriculture) and ecosystem services.
- 1.6 Uncertainty in climate change model projections may be translated into perceptions of uncertainty as to its existence.
  - 1.6.1 People are increasingly reporting a feeling of being swamped with information, and this will necessarily constrain their ability to process any new information.
  - 1.6.2 The release of the UKCP09 probabilistic projections had limited success in helping inform the public about the range of possible changes.

2. *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

Climate change related to energy:

- 2.1 Environmental NGOs and other third sector actors are the most trusted sources of influence in relation to energy saving (GILDED European Policy Brief 4). This is followed by the media, Authorities (eg Government energy departments) and friends, which are ahead of central government and local government, with EU politicians and authorities coming last.
  - 2.1.1 This suggest that government, advisers and scientists should concentrate on building the existing consensus, that current resource use is unsustainable, rather than attempting to convince the public of the scientific view on climate change.
  - 2.1.2 The GILDED project provides evidence that individuals show a preference for a lead to be taken by government (at EU, National and local levels) through allowing public bodies and stakeholder partnerships to demonstrate the benefits of action across different sectors, such as infrastructure, transport and energy planning.
  - 2.1.3 International policy (eg EU) should enable national governments and industry leaders to implement tangible GHG reduction practices alongside policies focused at other levels (Nijnik and Bizikova, 2008), (eg household, individual) in order to engender a sense of shared responsibility for action.
- 2.2 Evidence suggests that policymakers and local authorities have a role to play in drawing attention to business models that demonstrate continued profits as a result of responding to climate change policies, such as reducing GHG emissions.
  - 2.2.1 Policy incentives that encourage business leadership are required to build public acceptance of the need to adopt more climate friendly lifestyles. In environments where public funding might be scarce such policies may be the main drivers for achieving overall policy goals relating to addressing climate change.

— 2.3 Information and advice on climate change policy needs to be clear, consistent and linked to feedback on the impact that collective action is making. Such information needs to relate primarily to tangible goals and behaviours, such as reducing energy or increasing recycling, which are easier for people to relate to than more abstract concepts relating to climate change in general.

3. *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

— 3.1 In developing communication approaches to improve public understanding of climate change leading to positive behavioural responses, it is necessary to understand the range and variability of individuals and communities, the motivations that influence them and how they react to information.
  — 3.1.1 Communication of uncertainty should address the range of possible variability and how this might affect people.
— 3.2 Whilst policy and market forces are the primary drivers of behaviour change, social norms and relationships with peers and friends within communities do influence decision-making and uptake of new behaviours.
  — 3.2.1 Environmental values can be developed from an early age via family, peers, formal and informal education, media including television, books, newspapers, magazines and new social media: the internet, social networking, blogs etc.
  — 3.2.2 While knowledge on its own is not usually sufficient to drive behaviour change, educational policy that promotes an understanding of the science underlying environment issues means that individuals are better equipped to make future decisions to adopt pro-environmental behaviours.
— 3.3 Stakeholders who mediate between individuals and their communities and regional authorities are recognised as key to building partnerships and networks necessary for coordinated policy implementation.
  — 3.3.1 Such third sector actors (NGOs, community development groups etc.), can be powerful stakeholders because they mediate between households and those implementing policy at different levels and therefore have considerable leverage on the degree to which policies can influence behaviour.
  — 3.3.2 Public and private bodies need to continue efforts to engage in network building, showcasing examples of good practice, and these should improve the transmission of information and skills (Bizikova et al., 2012). This includes identification of local stakeholders who may become drivers of energy saving and awareness raising, and whose economic interests and moral commitments are associated with energy saving and use of renewable sources.
— 3.4 Surveys of climate change issues may be problematic in that there is heterogeneity in responses due to motivation and ability to process information in decision strategies (Fischer and Glenk 2011).
— 3.5 Climate scepticism may be particularly common amongst older people from lower socio-economic backgrounds who are conservative and hold traditional values (Tradition, Conformity, Security). In contrast, climate scepticism was less common among younger people from higher socio-economic backgrounds who hold self-transcendence (Universalism, Benevolence) and environmental values. Whilst those non-sceptical of climate change showed attitudinal certainty, those sceptical of climate change did not, suggesting that people who are sceptical might be easily convinced of its true nature. This in turn suggests that public understanding of climate change might be improved by concentrating on changing the attitudes of sceptics (Poortinga et al 2011).
— 3.6 The media (traditional and new social), along with scientists and other stakeholders (including teachers and education professionals), can play a positive role in assisting with information exchange between different levels, building networks of activists and transferring skills and knowledge.
  — 3.6.1 But this can be reversed or distorted if powerful sceptics influence these media types.
— 3.7 Public understanding could be improved by presenting the public with consistent and accurate messages about what climate change is. Corner et al (2012) found that attitudes towards climate change became significantly more sceptical after reading newspaper editorials that made opposing claims about the reality and seriousness of climate change.
  — 3.7.1 A key issue here is the media presenting representative coverage on climate change issues (informed by scientific consensus) rather than giving equal weighting to opposing (polarised) views.
— 3.8 Forms of communication and message content needs to be tailored to target audiences.
  — 3.8.1 The use of case studies putting impacts and consequences in terms that people can place into the contexts of their own daily lives, ie reduced crop yields leading to shortages and price increases.
  — 3.8.2 Media can reduce the perception of isolation of the problem: that individuals acting alone will not be significant.

4. *How important is public understanding in developing effective climate change policy?*

The James Hutton Institute research suggests that public understanding of climate change is very important in developing effective policies:

- 4.1 There is a key role for participatory partnerships in developing viable recommendation for policy development (Aquarius 2011).
- 4.2 Evidence from the GILDED FP7 European project, which looked at individuals' lifestyle choices and understandings of energy issues, notes that people find climate change itself an abstract idea that is not sufficiently tangible in relation to everyday life and making decisions about behaviour choices. Ideas about more concrete actions, such as waste and energy usage, are more easily understood and as a result more "actionable".
- 4.3 Different groups within society respond more or less favourable to different policy types, depending on their values and beliefs. Policies and regulation should therefore be perceived as generally equitable and not favouring one group in society over another—most people will not take actions for the common good if others are seen to benefit without cost to themselves.
- 4.4 Example from climate related flood risk research: The results of a Scotland-wide survey showed that there was considerable support among the Scottish public for investments into measures to adapt to floods and low flows in Scotland. Participants' perceptions of the potential threat of flooding and low flows and the different policy options informed attitudes and willingness to pay for policy measures (Glenk and Fischer 2010).
- 4.5 Policies requiring little or no personal sacrifice are more likely to be adopted than those requiring individual behaviour change. Politicians seem unwilling to make unilateral changes that they perceive will be unpopular with electorates, but the GILDED study suggests that within households people would like to see increased leadership and solid arguments from those in a position to shift policy away from the current carbon intensive society.
- 4.6 The level of importance is likely to be different between mitigation and adaptation based policies.
- 4.7 Evidence from the FarmPath project (Sutherland et al. 2012) suggests that farmers will adopt renewable energy production as an instrumental response to enhancing profit, rather than an altruistic response to climate change.

From wider research areas:

- 4.8 Public understanding of climate change appears vital in developing effective climate change policy. Bord et al. (2000) found that the key determinant of behavioural intentions to address climate change was a correct understanding of the causes of climate change.
- 4.9 Lorenzoni et al (2007) concluded that one of the main barriers to people engaging with climate change is a lack of knowledge about its causes and consequences [including scale dependence see 4.8.1], as well as understanding of the potential solutions. They also concluded that uncertainty and scepticism about the causes of climate change, its seriousness, and both the necessity and effectiveness of actions to mitigate climate change, are another main barrier to public engagement.
  - 4.9.1 As an example of specific relationships in causes and consequences that are significant but receive little public attention, The James Hutton Institute and collaborators research exploring the role of soil microbial communities in driving N_2O emissions from arable systems suggests that fungi are important (Herold et al 2012), explain why it has been difficult to link microbial population dynamics with emissions in soil (Giles et al 2012) and demonstrates variation in emission from soil supporting different barley cultivars which may provide a route to mitigation through breeding (Daniell et al unpublished).

5. *What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?*

- 5.1 People who have a poor understanding of climate change, or who do not accept that anthropogenic climate change is happening, are less likely to be persuaded by scientific or technical arguments to change their behaviour.
  - 5.1.1 There is therefore a need for improved communication and to set climate change policies that aim to change behaviour in the context of more tangible environmental issues, such as energy efficiency to reduce rising fuel costs. For example, developing more energy-efficient technologies and switching to renewable energy sources are the most favoured approaches for people with pro-environmental and altruistic values, while cost-saving is more effective for people with hedonistic and egoistic values.
- 5.2 Research suggests that the range of attitudes, beliefs and values among the public must be taken in to account by policy makers and civil society actors in drawing up climate change policy, by targeting different messages to different segments of the population.

— 5.2.1 Thus for those with altruistic and environmental values respond better to policies with an emphasis on personal responsibility, while those with egoistic or hedonistic values respond more positively to policies which have an element of cost saving. For those in-between, messages stressing the need for sustainable resource use and the government's own commitment and initiatives may strengthen their orientation toward altruistic and environmental values.

6. *Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?*

Whilst there may be sufficient evidence in the broad range of scientific literature and research expertise in social and behavioural sciences within the UK (and drawing on wider international capabilities) to support the capacity of the government, the challenges lie in integrating these across a broader range of science disciplines in order to develop coherent and consistent messages to the public and consequential development of relevant policies.

To achieve this integration of science disciplines places a large emphasis on within-government communication and collaboration across Departments. There is a need to better understand the consequences and trade-offs of proposed policies across a broad range of science areas (social, behavioural, environmental). Again, this requires inter-disciplinary research. The expertise within government to handle such levels of inter-disciplinarity is currently not well developed.

— 6.1 Government Departments and policy development teams can benefit greatly from the inclusion of non-obvious people (internal and external) in the team, to act as cross-disciplinary facilitators.

— 6.2 Being mindful of, and acknowledging the importance of, such connections can be useful in terms of designing strategies for formulating effective policy.

— 6.3 Use of consistent messages and language across Departments is vital.

— 6.4 Within the Scottish Government (RESAS) there is a drive for inter-disciplinary co-constructed research through more joint policy focussed projects between social and physical scientists.

— 6.5 The Cabinet Office Behavioural Insights Team works across Departments and is seen as a good example of inter-disciplinary collaboration and has produced useful documents, ie "Behaviour Change and Energy Use" (Cabinet Office Behavioural Insights Team 2012).

— 6.6 However, care is needed as there may be a tendency for review-based-evidence documents to take on a life of their own, which is potentially unhelpful when it comes to formulating recommendations for a specific policy. Additional academic expertise is often needed to ensure that what might be called headline-theory within such documents is not translated into policy without being adequately scrutinised.

7. *Can lessons about public engagement with climate change policy be learned from other countries?*

— 7.1 Yes, valuable lessons can be learned from the experiences of other countries (Nijnik and Bizikova, 2008). eg a study analysing the cases of Germany, Finland, the United Kingdom, the United States and Canada shows that these "early adapters" (Bizikova et al., 2012) have an improved regional and national understanding of climatic impacts, and of the risks to agriculture before the initiation of the planning process.

— 7.1.1 The interplay between bottom-up and top-down initiatives was crucial in the development of adaptation strategies. The former has provided rich and robust participation in designing, implementing and monitoring adaptations, while the latter was important for prioritizing and legitimizing the development of strategy. It also provided access to high-level decision-makers and funding.

— 7.1.2 The results suggest that fostering cross-sectorial collaboration, especially by focusing on broader questions such as the role of agriculture in society, has become an important part of adaptation planning.

— 7.1.3 Results stress that adaptation could be enhanced by skills development and mutual learning across stakeholder groups, research and policy-makers, and through the on-going interactive development of institutional capabilities.

The challenge will be in understanding the relevant specific details per country (historical and cultural, political economy, climate, resources available etc.) and putting these into a UK context:

— 7.2 Different countries have different cultures, laws, service infrastructures (eg options for heating, transportation and food), climates and available resources (COST Action 2009).

— 7.2.1 It is therefore relevant to link and coordinate research across countries to identify lessons about public engagement with climate change policy within different governance arrangements. This will enable evidence to show which policies work best overall, and where more specific approaches might be required. For example, there may be important differences between previous Soviet-influenced and capitalist European economies, or between developed and developing countries.

- 7.3 European research across different countries shows that across all countries (in the GILDED study the Czech Republic, Netherlands, Scotland, Hungary and Germany) people think that climate change is a serious problem. However, in some countries people were more sceptical (thinking that climate change is exaggerated) than in others.
- 7.4 Examples:
  - 7.4.1 Australia: has an Emissions Trading Scheme linked to the "Carbon Farming Initiative" to facilitate up-take of good farming practice to reduce GHG emissions and sequest carbon. The issue of carbon offsetting and trading has been analysed also with its relevance to the UK (Nijnik et al. 2011).
  - 7.4.2 Costa Rica: government supports a range of Payment for Ecosystem Services schemes to support good environmental management for multiple benefits including carbon sequestration. However, the majority of PES schemes in Latin America (77%) set the payment levels from top-down decisions rather than from bottom-up stakeholder consultation, which can be problematic since opportunity costs (of sellers) and willingness to pay (of buyers) might need to be met (Martin-Ortega et al. 2012).

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Farmpath: Farming Transitions: Pathways towards regional sustainability of agriculture in Europe. http://www.farmpath.eu/

NESEMP: The ongoing North East Scotland energy monitoring project (NESEMP) is examining the relationship between different types of energy feedback and psycho-social measures including individual environmental attitudes, household characteristics, and everyday behaviours. As part of this on-going project, several hundred households are being monitored and the electricity usage is recorded every five minutes using CurrentCost monitors. (Craig, T., Galan-Diaz, C., Heslop, S., Polhill, J.: The North East Scotland Energy Monitoring Project (NESEMP). In: Workshop on Climate Change and Carbon Management. The James Hutton Institute (March 2012).

April 2013

Written evidence submitted by Paul Matthews, School of Mathematical Sciences, University of Nottingham (CLC025)

Declaration of Interests

I have no financial, commercial or other interests relevant to this issue.

Increasing Scepticism

1. Over the last few years there has been an increase in public scepticism over the subject of man-made climate change. This has become apparent through a number of recent surveys and opinion polls. A recent editorial article and sequence of research papers [1] summarises this situation. However, the change of opinion is fairly modest, and there has been a tendency for both sides of the debate to overstate this trend and its significance.

2. The 2012 LWEC survey [2] found that "A growing number of people in the UK do not trust climate scientists to tell the truth about climate change" and "the UK public's belief in the seriousness of climate change has decreased over the past five years". 63% of survey respondents were at least "fairly concerned" about climate change, down from 71% in 2010. Those "not at all concerned" increased from 8% to 13%. 44% thought that climate change was exaggerated, a slight increase. Particularly notable was the low and declining levels of trust in Environmental groups, Government scientists and the media (Figure 2 of the LWEC report). Only 10% trust the government, and only 13% trust government scientists, to provide correct information on climate change. Trust in environmental groups has fallen from 46% in 2006 to 32%.

3. This increasing scepticism is not unique to the UK but part of a global pattern. A survey by NORC reported in February 2013 that the environment ranked low among issues in most countries, and a Globescan survey on environmental concerns including climate change announced that "Environmental concerns among citizens around the world have been falling since 2009 and have now reached twenty-year lows" .

4. Increasing scepticism has also been seen in the media. The Mail and Express have for some time shown sceptical views, but this has recently increased (at least four sceptical articles appeared in the Express in the week of March 18th). Among the broadsheets, the Telegraph [3] recently expressed the view that the Climate Change Act should be repealed. An excellent recent article in the Economist [4] discussed the flat global temperature of the last 15 years, the mismatch between models and observations and the increasing realisation among mainstream climate scientists that the sensitivity to carbon dioxide is less than they had previously thought. The FT reported in an article on the collapsing carbon market on 17 April that "global warming has been consigned to a seat in the waiting room".

Inquiry Terms of Reference

5. The remit of the inquiry seems to suggest that climate scepticism is a problem and that this change in public opinion is somehow wrong and needs to be corrected. This misguided view is at best undemocratic and at worst almost Orwellian.

6. The increase of scepticism is entirely rational and arises from a number of causes. Foremost among these is the exaggerated claims about climate change made not just within certain sections of the media but also, worryingly, from climate scientists themselves. Other factors include the climategate emails that showed scientists withholding data and hiding data that did not support their theories; the lack of any warming for the last 15 years; the run of recent cold winters; and the absurd energy policies involving unreliable and expensive

wind turbines paid for by increased public energy bills. In short, more and more members of the public are realising that the global warming story has been oversold.

7. One area where this realisation has not yet dawned is within government. There are several reasons for this: (a) Most of those in government have very little understanding of science; (b) government has been misled by biased advisers who in some cases are merely activists; (c) some of those in government have a direct conflict of interest due to their association with the renewables industry. The most notable example is Lord Deben, chair of the Committee on Climate Change, who is chairman of Veolia and formerly chairman of wind turbine manufacturer Forewind.

Specific Questions

8. The Committee has raised a number of specific questions. Unfortunately these questions are the wrong questions, are confused and show a poor understanding of the issues, making them difficult to answer logically. One basic implicit misunderstanding is the idea that if only more people could become better informed about climate change, more of them would accept the need for climate "action". This naïve view is known as the "deficit model" or "deficit fallacy" in social science (See for example the blog by Prof B Nerlich [5] on this specific STC inquiry; see also [6]). In fact, the opposite may be true—bombarding the public with information (or propaganda?) on climate change may make them more sceptical, particularly if this information comes from untrusted sources, which as noted above include government. A study by Kahan et al [7] comparing science literacy with concern about climate change showed that people with higher knowledge of science were slightly less concerned about climate change.

What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?

9. Public understanding of the issue is improving. But this is not helped by the constantly changing story presented by climate activists and some climate scientists. The phrase "global warming" has gradually been replaced by "climate change", particularly since the slow-down in warming of the last decade. In the 2007 IPCC report we were told to expect warmer winters, but since the recent few cold winters climate scientists are now claiming that colder winters are to be expected [8]. Another recent change is to blame a specific weather event such as a flood or hurricane on climate change, where previously anyone doing so was told that "weather is not climate". Public understanding of these misleading claims is improving, leading to increased scepticism.

Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?

10. As noted above, the LWEC survey [2] shows that government, media, business and environmental groups are not trusted. These are groups who may have political or financial motivations towards a particular view. The public are, quite rightly, sceptical of such sources. The most trusted group in the LWEC survey was independent scientists. Note again the "deficit model" delusion.

How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?

11. As already noted, a major barrier is the inconsistent and frequently changing story presented by climate scientists and the media.

How important is public understanding in developing effective climate change policy?
What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?

12. There is widespread resentment of the Government's misguided energy policies, that are simultaneously damaging the environment through the construction of wind turbines and associated additional power lines, and increasing fuel bills through ROCs and FITs. Wind turbines simply do not provide useful reliable energy, and require backup sources. This public outcry is largely just common sense, but is to some extent increased by the perception that the energy policy is being driven by the Government's adherence to climate change dogma.

Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?

13. As discussed in paragraph 8 and the social science blog [5], the issue of public understanding of climate science is much more complex and subtle than one might at first anticipate.

However, this is really the wrong question. The main issue is that the Government does not have sufficient understanding of the basic principles of science to formulate a sensible policy. There is an urgent need for input from more scientists and engineers, in particular those who are not directly involved in climate science.

Again, the implication that public opinion needs to be somehow manipulated to conform to policy is quite worrying.

Conclusions

14. The climate change message has been exaggerated, by climate activists, certain sections of the media and some climate scientists. More and more of the general public are gradually realising this, and therefore increasingly questioning expensive, destructive and pointless policies. Any attempt to try to "correct" this, for example by some new Government initiative to improve public understanding of climate science, would be doomed to failure.

15. If the Government genuinely wishes to understand why people are becoming more sceptical about climate change, the people to talk to, and in particular to listen to, are precisely those who are becoming more sceptical. This obvious point has been missed by the Government and also by most of the academic researchers in the fields of social science and psychology who have studied the question. In the words of one sceptical blogger, "All that's needed to create a dialogue is for someone to talk to us." [9]

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April 2013

Written evidence submitted by Dr Neil T. Gavin, The University of Liverpool (CLC026)

1. Executive Summary

1.1 Current research gives us limited understanding of how the structure and content of media coverage impinges on public understanding of climate change. Work done on television coverage—the public's most trusted and most used source of information—has been undertaken by this submission's author. It illuminates a set of worrying patterns that are under-explored by principal funders of research.

1.2 Unique research undertaken by the author suggests televisual coverage of climate change has diminished. But such coverage as there is has a measurable influence on the emphasis that citizens place on the topic as a significant issue facing Britain. This "salience" is an important precursor to further public engagement, but needs to be viewed in the light of climate sceptic coverage (a topic also under-explored in research).

1.3 This submission suggests that the main research funders need encouragement to support work that integrates of research on public attitude formation (heavily funded), with long-term assessments of press and television coverage of climate change.

1.4 Broadcasters in both the non-commercial and commercial sectors need to be challenged on the emphasis placed on documenting climate change. In addition, senior government politicians ought to be challenged on

the extent to which they are prepared to invest political capital in raising the profile of climate change. Finally, press editors should be challenged on their rationale for continued emphasis on climate scepticism.

2. Introduction

2.1 This evidence is based on the author's extensive contribution to political communication research. This straddles climate-related public relations, the coverage of climate change in all significant media (press, television and the internet),[1] and the media's impact on public attitudes.[2] The author of this is also currently Convenor of the Media, Communication and Cultural Studies Association's 'Climate Change, Environment and Sustainability network, an umbrella organisation for scholars researching environmental issues.

2.2 The evidence is also given against a background of ongoing exploratory research on climate change coverage's impact on public attitudes, and the incidence of climate sceptic coverage in the British press.3

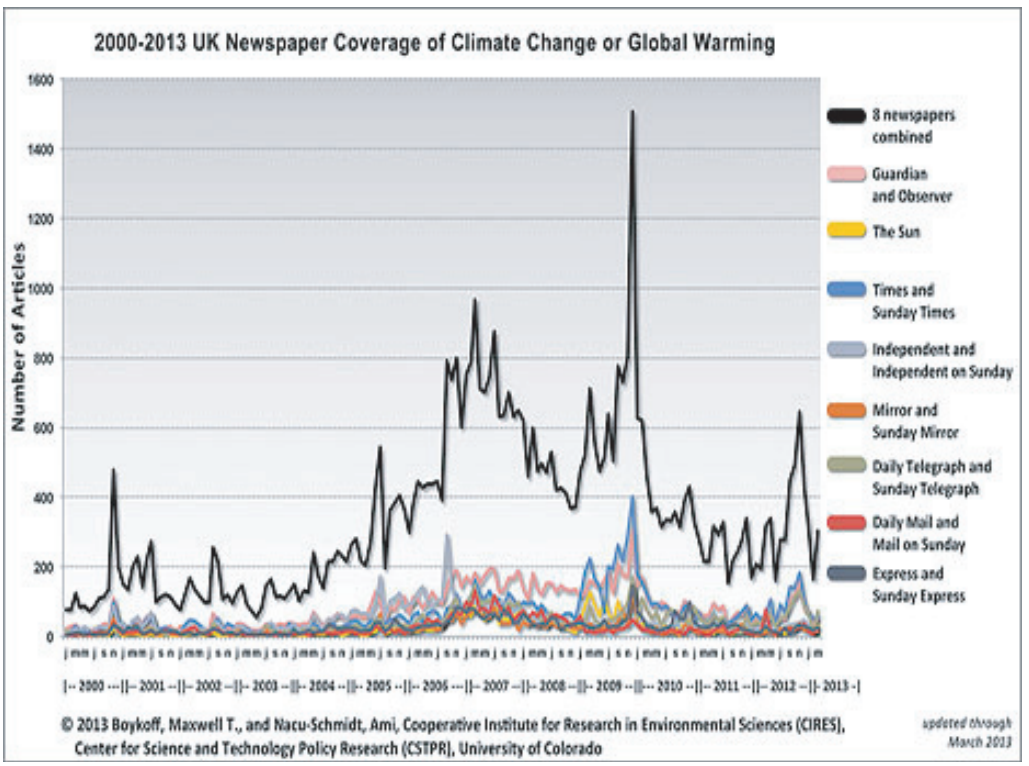
3. Factual Information

Background

3.1 The press is currently taking a diminishing interest in climate (see Figure 3.1). This is worryingly consistent with the rise, plateau and decline pattern outlined in "issue attention cycle" thesis, with we may well be at a phase characterised by declining interest and a "post-problem" mentality.[4] Here, spikes around the Copenhagen conference and recently, are not necessarily reassuring, as they may represent the "spasmodic recurrence" of attention allowed for in this perspective. In addition, this overarching pattern cannot be looked at in isolation from the much, much larger quantity of coverage that bears on non-climate, "bread-and-butter" issues, like crime, health and economics.[1]

Figure 3.1

UK PRESS STORIES CONTAINING "CLIMATE"



Source: http://sciencepolicy.colorado.edu/media_coverage/uk/index.html

3.2 The underlying structure of this coverage has some features that are well established. First, the broadsheet (and notably the Guardian and Independent) make a very notable contribution. Second, broadsheet coverage has a sophisticated take on climate change, with sceptical messages, according to some assessments, much less apparent than they were.5 Third, the high circulation mid-market and tabloid press takes a lesser interest, but the tabloid in particular are not trusted, nor are they cited by citizens as their principal information source. Nevertheless, the wider literature on "media effects" suggests that broadsheets and the mid-market "black top" titles have the *potential* to influence public appreciation of climate change.[2] Other work on public perceptions of the climate commentary suggests the citizens cite the media as a source of climate information, talk to family and friends about such coverage, but nevertheless continue to dispute global warming's anthropogenic basis, and are still confused about the science.[6]

3.3 What is much *less* well-understood, is how television which *is* trusted used as a reliable information, refracts climate issues. The author's research suggest that even at significant "moments" for climate change (such as Copenhagen, 2009), television *news* coverage is quite modest, a historical pattern noted by others.7 It also suggested that climate sceptic messages are more prominent than is commonly acknowledged, or healthy. However, there is very little research that deals *directly* with the impact of such coverage.[6]

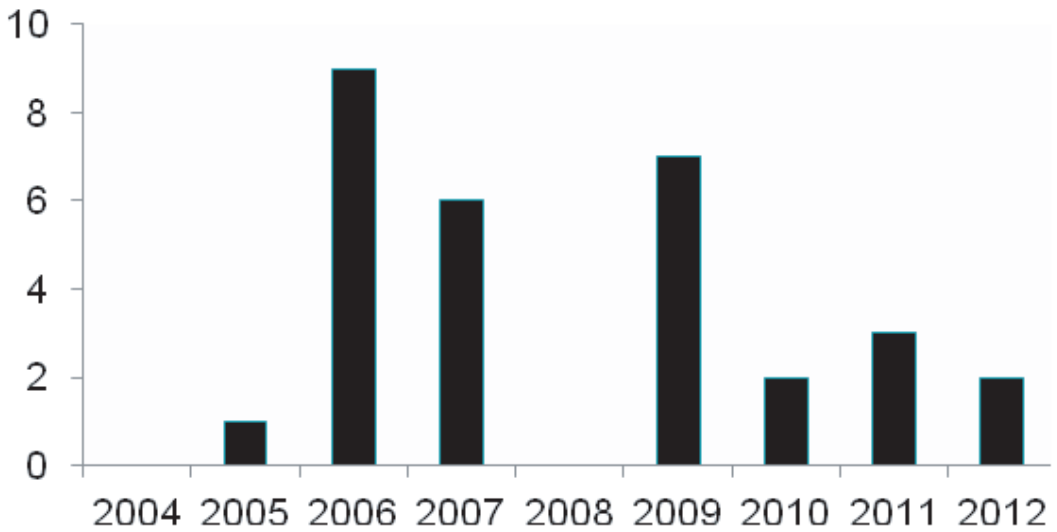
3.4 Some current research has sought to update what the public think about climate change, and how this relates to media representations, sponsored by UKERC and by a combination of NERC, DECC and Defra.[8] However, solid as this work is, it suffers in some important respects. The focus is primarily on attitudes and attitude development. But it is not closely articulated to an assessment of the long-term patterning of coverage across *all* media (especially, though not exclusively, with regard to TV coverage, or the prevalence of climate sceptic messages across the media). Finally, with a reliance on focus group techniques it does not explore the full range of ways in which "media impact" is generally conceived and evidenced.

Recent research

3.5 What little work that has been done on TV documentary coverage of climate change, has been conducted by this submission's author.1 This genre is important. It is a source citizens trust, and documentaries can give sustained attention to the issue lacking in *news* bulletins. An ongoing and exhaustive survey of climate documentary programming shows the same *general* structure as press coverage—a rise, plateau, then decline (see Figure 3.2 below, and Appendix). It is noteworthy that, like press coverage, the greatest emphasis came at a time when the Prime Minister, Chancellor and DECC Minister all strove persistently to make climate change a high profile issue at the heart of government (with Opposition leaders compelled to position themselves accordingly). The current situation has seen both a drop in press and television coverage, at a time when climate change is given a much lower profile by significant figures in the government.

Figure 3.2

YEAR-ON-YEAR DOCUMENTARY COVERAGE OF CLIMATE CHANGE



3.6 The structure of documentary coverage is concerning for a number of reasons. First, the vast bulk of these documentaries are on BBC, *not* the commercial channels. This is understandable, if commercial broadcasters consider this form of programming unlikely to draw large audience, and hence generate limited advertising revenue. But this perhaps consigns their duty to keep the public informed about one of the most commanding issues of our generation, to a second-order priority. Second, of the last three documentaries, only one was on *BBC1*. Before this, there was only one in late 2009 and another in mid-2010. The rest predate March 2007.This too is significant. BBC1 is the place where viewers are most likely to encounter documentaries. They watch around 9.8 hours per year on BBC1,8 so a drop off here is potentially significant for audience exposure to the issue. ITV1 is next in line, with the public watching 3.8 hours per year on this channel—a considerable way behind. But although the last two documentaries were on ITV1, there were *no* others in our inventory. Again, audience exposure to climate change (or, rather, its absence) is an issue here. Finally, the vast bulk of documentaries were on *niche* channels characterised by low audiences (BBC2, BBC3, BBC4, and to a much lesser extent, on their commercial counterparts).

3.7 This picture is significant in itself, but more so in view of recent exploratory research undertaken by this submission's author, on the media's so-called "agenda-setting" role—where they possess the power to direct citizen attention to particular issues, via the quantity of coverage. Their output influences the extent to which citizens consider an issue a significant one facing the country (its "*salience*"). The analysis explored the period

between 2000 and late 2007, before "the economy" began to dominate political, media and public agendas. Unlike Figure 3.1, it only tracked press stories where climate figured in *headlines*. In addition, it differentiated between stories from the broadsheets, the mid-market "black tops" (Mail/Express), and the "red top" tabloids, and entered them *separately* in the model. A number of political events (such as 9/11 and Gulf War 2) also figured in the assessment, to determine if they had any role in distracting citizens from environmental issues. Finally, and uniquely, our analysis factored in the Figure 3.2's documentaries. But, in addition, a *separate* variable was entered for the "Great Global Warming Swindle" documentary, because—unlike all others—its highly controversial message was unequivocally at odds with the scientific consensus.

3.8 The results suggest that only broadsheet coverage had an impact on "salience". There was no such impact for either the "black tops" or "red tops", nor did the political event variables achieve statistical significance. But importantly there was an interaction effect between broadsheet coverage and documentary coverage: in effect, the two mediums *conjoin* to produce a greater influence on salience, than the broadsheet press would on its own. Additionally, the "Great Global Warming Swindle" had an independent, measurable and statistically significant impact in *lowering* salience. This particular finding is unsurprising in some respects. 'Swindle's highly controversial nature helped generate an audience of nearly two million, in all likelihood far beyond that of many (if not all) the other documentaries. In addition, it generated supportive commentary in the Telegraph and the black top press.1 But, if unsurprising, the finding is still worrying, given its potent counter-consensus message. The results underscore the problematic nature of Channel 4's defence of its broadcast, on the grounds that it *balanced* a portfolio of environmental output which also contained material consistent with the scientific consensus.9

3.9 Given the findings, it is no surprise that with climate change now diminished in press coverage (Figure 3.1), and documentary coverage dwindling (Figure 4.1), the salience of the environment is at a record and worrying low, and on a sharp downward track. [10] But another feature of ongoing research on the British press is pertinent here. It has tracked climate sceptic messages in our national newspapers, and suggests unchallenged contrarian commentary is still persistent in a broadsheet press that helps drive the salience of climate (notably in the Telegraph), and in a black top press that so conspicuously supported the "Great Global Warming Swindle" documentary.[3]

4.0 Conclusions

4.1 From the perspective of the evidence presented here, the picture is concerning. It invites us to consider a number of interrelated issues. To what extent do we need a research agenda that takes into consideration the structure of climate change coverage in the widest possible range of media? Do we need to find a way to integrate existing research on climate attitudes and attitude development, with a fuller appreciation of these structures. And to what extent do the principal funders of such research need to be encouraged to acknowledge such issues?

4.2 In addition, there are questions for the broadcasters and for the press. Given the remit of the former to educate and inform the public, how far are they prepared to go to document climate change in the future? Will their output reflect the urgency the scientific community express about the issue, and will this be tempered significantly by concerns about audience figures and advertising revenue? And to what extent will counter-consensus messages like that embodied in the "Great Global Warming Swindle" be given a place in broadcasting output? For newspaper editors, some of the same themes emerge. Although, the press acknowledge no obligation to inform or educate the public, they should perhaps consider more fully than they do at present, the potential impact their coverage has, and the extent to which it serves the public good.

4.3 Finally, what role do senior government politicians have in heightening the media profile of climate change? The media often take their cue on what is important from these figures. Here, the issue of political leadership comes to the forefront.

Declaration

The author of this evidence declares no conflict of interest in its presentation.

April 2013

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APPENDIX

CLIMATE CHANGE DOCUMENTARIES

Horizon: Global Dimming (BBC2, Jan. 2005)

Seven Days That Shook the Weathermen (More 4, Feb. 2006)

Meltdown: A Global Warming Journey (BBC4, Feb. 2006)

Climate Conspiracy or Global Catastrophe? (BBC4, Feb. 2006)

Art From the Arctic (BBC4, Feb. 2006)

The Life and Times of El Nino (BBC4, Mar. 2006)

Are We Changing Planet Earth? (BBC1, May 2006)

Global Warming: Bush's Climate of Fear (BBC1, Jun. 2006)

Can We Save Planet Earth? (BBC1, Jun. 2006)

Five Disasters Waiting to Happen (BBC2, Jun. 2006)

Climate Change: Britain Under Threat (BBC1, Jan. 2007)

Five Ways to Save the World (BBC2, Feb. 2007)

Dispatches: Greenwash (CH4, Mar. 2007)

The Great Global Warming Swindle (CH4, Mar. 2007)

Panorama Goes Green (BBC1, Mar. 2007)

How Green is Your High Street? (BBC2, Jun. 2007)

Britain's Embarrassing Emissions (BBC3 Jul. 2009)

Future of Food (i) (BBC2, Nov. 2009)

This World—Can Obama Save the Planet (BBC2, Nov. 2009)

Earth—Climate Wars (i), (ii) and (iii) (BBC2 Dec 2009)

Hot Planet (BBC1 Dec 2009)

Panorama: What's Up with the Weather (BBC1 Jun 2010)

Dispatches: The Great Green Smoke Screen (CH4, Jun 2010)

Horizon: Science Under Attack (BBC2 Jan 2011)

Storyville: Meet the Sceptics (BBC4 Jan 2011)

Frozen Planet: On Thin Ice (BBC1 Dec 2011)

Horizon: Global Weirding (BBC2 Mar 2012)

Tonight: The Great British Weather (ITV1 May 2012)

Tonight: Whatever Happened to the Summer (ITV1 Sept 2012)

The Committee might care to enquire what plans and provision, if any, are being made by the BBC in particular to highlight in documentary coverage in a manner that will gain public attention.

Written evidence submitted by UNICEF UK (CLC027)

1. Introduction

1.1 The UK National Committee for UNICEF welcomes the opportunity to submit evidence to Science and Technology Committee Inquiry into Climate Change: public understanding and its policy implications

1.2 UNICEF, the United Nations Children's Fund, is mandated by the United Nations General Assembly to advocate for the protection of children's rights, to help meet their basic needs and to expand their opportunities to reach their full potential. UNICEF is guided by the United Nations Convention on the Rights of the Child (CRC) and strives to establish children's rights as enduring ethical principles and international standards of behaviour towards children.

1.3 Climate change is one of the biggest challenges facing children, both now and in the future. Children are the least responsible for the causes of climate change and yet bear the brunt of the impacts both now and in the future. Similarly, today's children and future generations will bear the future consequences of inaction on climate change today- such as higher taxes to fund responses to climate change and the impact of climate related disasters. Children therefore are key stakeholders in action against climate change and under the CRC, they have a right to participate in decisions affecting them, climate change undeniably falls into this category.

1.4 This submission will focus on the public understanding of children and young people to climate change, and how this links to public understanding of climate change overall. Specifically, this submission will focus on the following aspects of the Science and Technology Committee's call for evidence:

- What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?
- How important is public understanding in developing effective climate change policy?
- Can lessons about public engagement with climate change policy be learned from other countries?

2. *What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?*

2.1 In April 2013, UNICEF UK commissioned polling through IPSOS MORI[45] about the attitudes of children in the UK and parents to climate change and its impacts.

2.2 The research found that children in the UK are overwhelmingly concerned about how climate change will affect their generation. Specifically 74% of young people aged 11–16 stated that they are worried about

[45] UNICEF UK/IPSOS MORI, April 2013

how climate change will affect the future of the planet and believe the world will have changed as a result of climate change by the time they are adults.

2.3 The findings also show that children are not only concerned about how climate change will affect them, but also how it affects children in other countries- nearly two-thirds (63%) of young people were worried about how climate change will affect other children and families in developing countries. This demonstrates growing awareness of the impact that climate change is having in developing countries, and specifically on children. UNICEF research from 2011[46] shows that children in developing countries are bearing the brunt of climate change, despite being the least responsible, highlighting that there are approximately 756 million children living in the top ten most vulnerable countries to climate change.

2.4 Children in the UK also want to see the Government take more action on climate change to safeguard their future—72% agreed that they want the UK Government to do more to tackle climate change.

2.5 The polling also indicated strong understanding of climate change amongst children- with 89% of 11–16 years olds stating that they knew about climate change. This demonstrates strong public awareness of climate change amongst young people.

2.6 As well as polling young people, a representative sample of 2004 adults were also surveyed. Parents and grandparents expressed less concern about climate change than young people, but nonetheless, over half (58%) agreed that the effects of climate change will mean their children will not grow up in the same natural environment as they did and 61% agreed that the UK Government should take more action to combat climate change.

2.7 This data highlights a strong understanding and awareness of climate change and its future impacts amongst children in the UK. This is particularly notable considering that children today and future generations will feel the greatest impact of climate change. It also shows that despite the growing fears of increased climate scepticism, children are in fact very convinced about climate change and have strong views on the need to take action.

2.8 The data also shows a growing understanding amongst children and adults that climate change is an intergenerational issue and one that will overwhelming impact on today's children and future generations. This highlights an increasing understanding of climate change as a long term phenomenon and indicates potential growing appetite for long term policy solutions and long term thinking.

2.9 The strong support for further government action on climate change from parents and children also defies the current perception that the public believe the UK Government are doing too much on climate change. Our evidence demonstrates instead that when climate change is understood as an issue affecting today's children and future generations there is strong support for action.

2.10 The polling research suggests that improving understanding of climate change as an intergenerational issue and as an issue that affects children and young people today could lead to more support for action on climate change.

Summary

Three quarters of UK children aged 11–16 are concerned about how climate change will affect their future and would like to see the government take more action. 61% of adults would like to see the UK Government take more action on climate change

Recommendations

- Evidence indicates that children are concerned about how climate change will affect their future. This should act as a powerful driver for policy change to ensure today's children and future generations can survive and thrive in the face of climate change.
- There is a case for exploring better communication of climate change as an issue affecting children and grandchildren- this could help gain further public understanding of the long term impacts of climate change and galvanise support for long term policy action.

3. *How important is public understanding in developing effective climate change policy?*

3.1 Increased understanding of climate change often leads to increased support for climate change policy decisions. For example, the UNICEF UK/IPSOS MORI polling shows that children have strong awareness of climate change (89%) and this translates into strong support for further action on climate change—72% of children would like to see the Government do more on climate change. In other words, stronger public understanding of climate change and its implications can result in greater engagement in climate change public policy and potentially greater support for it.

3.3 UNICEF UK also believes that there is a need to involve those who are and will be affected by climate change in climate change policy to make it truly effective. UNICEF's work internationally highlights that when children understand the risks faced by them from climate change and are included in decision making, they

[46] http://www.unicef.org.uk/Latest/Publications/climate-proof/

are able to help shape policy that truly protects them from climate change. For example, in the Philippines, UNICEF has run education programmes about climate change with children, highlighting the risks they face from climate related natural hazards such as cyclones. Following this children were consulted on government climate change adaptation strategies where they were able to cite their concerns and the risks they faced. This meant the climate change policy developed by the local government addressed the concerns of children, key stakeholders, but could also effectively protect them.[47]

3.4 The UK Department of Energy and Climate Change's youth panel, which UNICEF UK actively supported, also showed the benefits of including children and young people in climate change decision making. Involving children and young people in the policy making around future energy pathways ensured that children (who will bear the consequences of today's energy decision making) were able to be involved in key climate change policies that will affect their future. Their involvement also meant that they had a deeper understanding of the issues and were consequently more involved and supportive of climate change policy initiatives.

SUMMARY

Increased understanding and awareness of climate change in children indicates that they are more supportive of policy action by the UK Government on climate change.

RECOMMENDATIONS

- UNICEF UK recommends that public education on climate change will help increase support for climate change policy and action by the UK Government.
- UNICEF UK recommends involving key stakeholders (such as children) in climate change in the formulation of climate change policy- this will help deliver effective policy that is supported by those stakeholders and that will deliver action that will help protect them.
- Specifically, the UK Government should find a way to systematically consult with children and young people on their international and domestic climate change policy.

4. *Can lessons about public engagement with climate change policy be learned from other countries?*

4.1 As children will inherit the legacy of today's climate change decision making, and suffer the worst impacts of climate change in the future, it is right that they should be actively involved in climate change policy.

4.2 In all countries, young people have a critical role in policy decision-making. For energy and climate mitigation policies, young people add value with their connections to cutting-edge energy technology research, global collaboration and online innovation skills. In fora that focus on appropriate adaptation and technology transfer strategies, young people often have the closest connection to climate impacts already being felt and have the most at stake when the economy and environment of their future is under discussion.

4.3 UNICEF encourages the strategic participation of adolescents and youth in climate change policy actions at international, national, local, and institutional levels.

4.4 The following are examples of UNICEF-supported child and youth-led climate policy initiatives that have delivered on action to tackle climate change, where lessons can be learned for practice in the UK:

4.5 Children's Climate Change Forum (CCF): Held alongside COP15 in Copenhagen, CCF was UNICEF's launching pad for broader youth engagement on climate change. 164 children from 44 countries participated, with equal representation by countries heavily impacted by climate change such as Haiti, the Maldives and Kenya, alongside Denmark, New Zealand and the United States. The Forum focused on training and empowering children to pursue climate actions in their communities.

4.6 Research based advocacy in Tajikistan: A UNICEF-initiated school-based hygiene and sanitation project supported adolescents and researchers to conduct high quality, weekly water testing across schools and communities. The resulting map demonstrated contamination in wells considered to be safe and determined key priority areas for decision makers. The adolescent researchers became strong advocates for action, convincing district health officials to improve sanitation conditions near water sources, while simultaneously educating community members to boil contaminated water before use.

4.7 UK Department Of Energy & Climate Change Youth Panel: With support from UNICEF prior to COP15, the Department of Energy and Climate Change (DECC) created a Youth Panel to advise government energy plans. DECC created a team of 16 young people who visited energy facilities, surveyed over 700 other young people, spoke with energy experts and helped develop an energy simulation website. Their final report was well-researched, significant, and meaningful for the DECC decision-makers in policy making.

SUMMARY

Children and young people have a right to be involved in climate change policy, and their involvement can yield benefits for action on climate change

[47] http://www.unicef.org/media/files/Climate_Change_Regional_Report_14_Nov_final.pdf

RECOMMENDATION:

— UNICEF UK recommends that the UK government and other actors find a way to systematically engage and consult with children and young people on their international and domestic climate change policy.

Joint written evidence submitted by Dr Emily Shuckburgh and Dr Rosie Robison (CLC029)

1. This evidence is submitted by Dr Emily Shuckburgh (British Antarctic Survey) and Dr Rosie Robison (Global Sustainability Institute, Anglia Ruskin University). It does not include, nor does it necessarily reflect the views of the British Antarctic Survey or the Global Sustainability Institute.

2. *Declaration of interest:* both authors undertake research into climate science communication. Emily Shuckburgh undertakes research into climate science and has published extensively in this area, she is Chair of the Royal Meteorological Society's Climate Science Communications Group, she also advises government departments on climate change on behalf of the Natural Environment Research Council.

3. Regarding the subject of this select committee inquiry, many observers now consider that the provision of information by experts does not on its own strongly influence public opinion or behaviour regarding issues with a scientific basis (health, climate change etc.). This has led to a rejection of an "information deficit model" in favour of promoting a two-way conversation between the public and experts as a more constructive and effective approach, and thus a focus on a goal of "public engagement" rather than "public understanding".

What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?

4. Less than half (41%) the UK public say they know "a fair amount" or "a lot" about climate change (Shuckburgh et al, 2012). This percentage has dropped from around 53% in 2006–9, although this may simply reflect an increased awareness of the complexity of the issue.

5. A consistently large percentage of the UK public think that the climate is changing: 80% in 2011 (Shuckburgh et al, 2012).

6. A significant minority believe that the seriousness of climate change has been exaggerated: 44% in 2011 (Shuckburgh et al, 2012).

7. People most commonly believe climate change is caused by a combination of human activity and natural processes (46%), with 28% considering it to be mainly or entirely human activity and 20% mainly or entirely natural process (Shuckburgh et al, 2012).

8. There has been a trend of decreasing concern about climate change in the UK over recent years, from 82% at least fairly concerned in 2005 to 63% in 2011 (Shuckburgh et al, 2012). The "finite pool of worry" (Weber, 2010) hypothesis states that as worry about other risks to which people are exposed (such as the financial crisis) increases, the concern given to other issues diminishes.

9. Many members of the public have particular aspects of climate change/climate science they are motivated to learn more about due to personal connections. These may be related to their work, their leisure activities, their family and friends, or past personal experience eg of weather/climate related events.

10. Our experience is that many non-expert members of the public do have a wide ranging and subtle understanding of climate change, are able to grasp new concepts, and are willing to engage in debate.

11. When asked what things contribute to climate change, people most frequently (47%) state "road transport" (Shuckburgh et al, 2012).

12. Various studies have found that there is a tendency for people to conflate climate change with other environmental issues and to understand climate change in terms of the broader concept of "pollution".

13. The British Social Attitudes surveys have found that a large percentage of people (71% in 2010), when prompted, say coal, gas or oil contribute to climate change. Energy use in some form or another was mentioned, unprompted, by almost half (47%) of the UK public in 2011 (Shuckburgh et al, 2012) as a contributor to climate change. However, only 19% specifically mentioned gas/electricity use at home or by businesses—it is possible that this failure to make an immediate association may influence people's attitudes to policy.

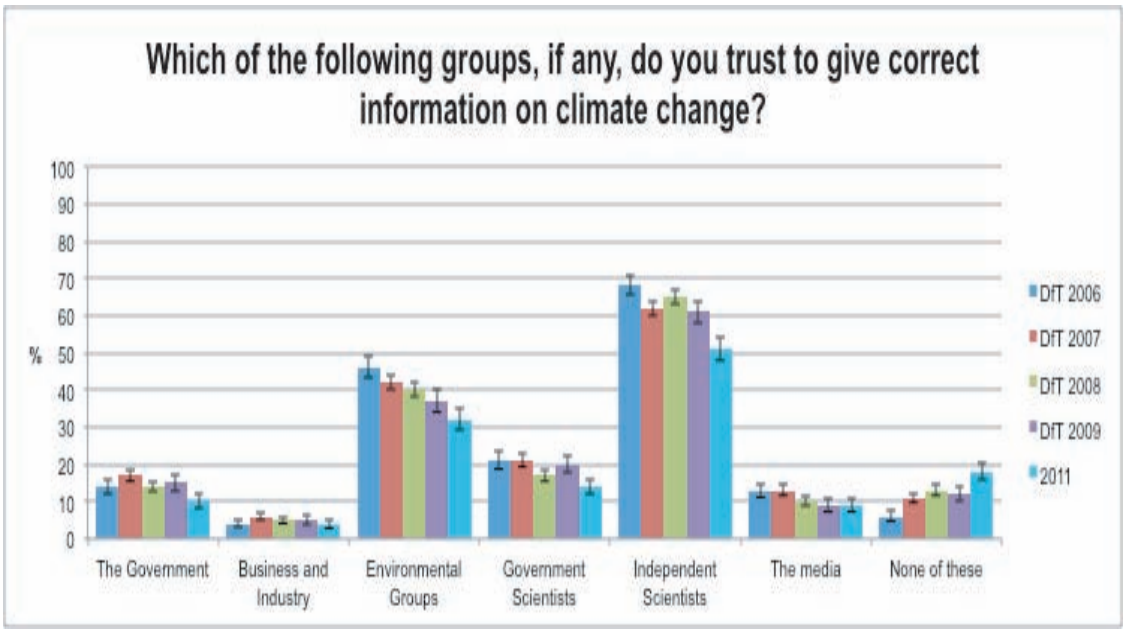
14. When asked in 2011 what the consequences of climate change are, 40% of respondents cited only impacts which are geographically and psychologically distant, generic increases in temperature, or a different environmental problem, or stated that they envisage no consequences (Shuckburgh et al, 2012).

Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?

15. Despite public surveys consistently indicating that more than two-thirds of the public trust scientists to tell the truth generally (and therefore being amongst the most trusted professions) a significantly lower percentage (38% in 2011 and 52% in 2013; data from Shuckburgh et al 2012 and British Science Association 2013) have been found in surveys to agree that "climate scientists can be trusted to tell us the truth about climate change".

16. Trust in all authority groups to give correct information on climate change has fallen in recent years (see figure below) and there has been a significant increase in the percentage who say that they trust none of the groups to give correct information on climate change. In 2011, 10% trusted the government, 13% government scientists and 51% independent scientists (eg university research centres) to give correct information on climate change.

17.



(figure from Shuckburgh et al, 2012)

18. There is ongoing debate over what may have influenced these trends, including the climate science controversies of winter 2009–10 and external factors influencing public trust in UK institutions more generally. Within a focus group setting, people often express concern that scientists or other communicators may have vested interests, in particular with regards to sources of funding.

19. Many members of the public feel that scientists are probably best placed to talk about issues regarding climate science, but that they are not always the best communicators. Many members of the public, understandably, are not very familiar with specific academic/research institutions, and certainly not with individual scientists. Such information therefore does not necessarily help them to assess the reliability of information.

How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?

20. It should be noted that what constitutes "public understanding" will be seen differently by different actors, through the lens of what is seen as problematic with current levels of "understanding". It is important to ask—what is assumed would be different if public understanding of what is meant by climate change was "improved"? We emphasise again that "engagement", which necessarily includes an openness to feedback from the public which could inform the scientific or policy process, is now seen as the most constructive strategy.

21. At a joint public meeting of the Royal Meteorological Society and the Royal Geographical Society (with IBG), on *Communicating Climate Science*, attended by 200 people working in science, media, policy, and the interested public, several challenges were identified by the speakers and audience, including: the desire of scientists to use impartial language, which may be difficult for the public to relate to and reduce their confidence in the communicator, the significant challenge of communicating uncertainty, and the question of how much climate science is even necessary/important for the public to have knowledge of (Robison and Shuckburgh, 2013).

22. Public awareness of the state of the scientific consensus could arguably be improved. Despite repeated analyses showing that the vast majority of climate scientists accept anthropogenic climate change as a reality, under two-thirds (60%) of the UK public agree with the statement "most scientists agree that humans are causing climate change" (Shuckburgh et al, 2012).

23. Focus group participants from the Shuckburgh et al, 2012 study wanted more simple diagrams or graphs to explain climate change stories in the news media, they appreciated simple language and everyday examples, where numbers were included they wanted them put in context, and simple explanations of mechanisms that could be easily understood helped to build trust in a story. They also found "indicators of change" compelling because these were seen as factual and impartial.

24. More effort could be placed on testing scientific explanations in advance on sample groups to check they are not misconstrued by the public. The communication of scientific uncertainty is particularly challenging and would strongly benefit from such a strategy.

25. The use of new and innovative ways of engaging with the public on climate change should be encouraged and their value assessed in a systematic way.

26. Barriers to public engagement on climate change include: an understandable reluctance of scientists to speak about polemic issues in situations where they may be asked to comment on aspects beyond their scientific expertise; the low level of public understanding of scientific uncertainty; awareness levels amongst both the scientific and policy communities of the non-cognitive based reasons why someone might accept or not accept information, (ie those reasons more bound up in emotion).

27. Arguably more leadership and support could be provided by scientific research organisations (including funders) to further encourage scientists to become involved in public engagement activities. Sharing among these organisations of ideas for public engagement and analysis of their success would also be welcomed. Public engagement activities take considerable time, recognition needs to be given to those scientists who conduct this work with dedication and skill, and an appropriate support structure needs to be maintained.

28. Television was the source of climate science news most cited by focus group participants in the Shuckburgh et al, 2012 study. Television documentaries can provide critical background information to later engage people in news reports. Features of a news report that make it more interesting to people include: a) relevance (stories related to UK future projections, to UK extreme weather and to UK wildlife were preferred); b) a strong narrative; c) "new" information, which could mean a new angle on established information; d) positive stories; e) non-alarmist but passionate delivery of the information; and f) the inclusion of information concerning how people might use the scientific results.

How important is public understanding in developing effective climate change policy?

29. There may be some level of knowledge that is necessary for the public to be able to engage fully in the debate about climate change policy, but it is not the only consideration. Also important may be an increased opportunity for the public to talk about what climate change means for the individual or for society as a whole, the recognition that the public have much to offer scientists as well as vice versa, and transparency in science results/reporting.

30. Many focus group participants in the Shuckburgh et al, 2012 study noted that they obtained their knowledge of science through school, including via their children and grandchildren. Ensuring there is a comprehensive representation of climate change and climate science in the National Curriculum is therefore important.

What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?

31. Shuckburgh et al, 2012 found that measures of public interest, engagement and trust associated with climate science are positively correlated with concern about climate change and willingness to change behaviour, while the belief that climate change is exaggerated is negatively correlated. However cause and effect could not be determined. Indeed many have suggested that values and political beliefs may be more important than scientific knowledge in determining public attitudes to climate change and policy.

32. An increased focus on efforts to communicate the science in open and transparent ways and to move away from a one-way communication "information deficit" model approach to embrace instead two-way engagement approaches may help foster a more trusting relationship between the public and scientists.

Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?

33. In the Shuckburgh et al, 2012 study we attempted to gather together previous polling statistics regarding public attitudes to climate change obtained by government departments and other bodies. It would be helpful to maintain such a database and to ensure a consistency going forward across government in terms of the wording and interpretation of polling questions.

34. More resources could be made available to adopt a systematic approach to the testing and evaluation of communications messages surrounding climate change and to maintain an on-going assessment of public attitudes to climate change. This is a critical gap.

35. We note that it is very easy to slip back to a "deficit model" mindset, even when one is aware of the limitations of this approach. In part because this is the first thing the public themselves will often say is needed (more education is the answer, people just "don't know" etc). It may also partly be because alternative models of engagement feel too difficult/time consuming/costly to implement, or are less straightforward in terms of measuring results.

36. We would be happy to give evidence to the Committee in person if helpful, but this is not requested.

37. Copies of our report, written together with Nick Pidegon, Climate Science, the Public and the News Media (Shuckburgh et al, 2012), and a summary of a meeting on Communication of Climate Science that we recently convened (Robison and Shuckburgh 2013) can be downloaded from: http://www.antarctica.ac.uk/staff-profiles/webspace/emsh/journals.html

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April 2013

Written evidence submitted by ClimateXChange (CLC031)

ClimateXChange provides responsive analysis and research to support improved public policy development and implementation in Scotland on climate change and the transition to a low carbon economy. ClimateXChange is a collaborative centre, with input from sixteen of Scotland's leading research and higher education institutions.

We have chosen only to address questions 1 to 3 in the consultation.

1. What is the current state of public understanding of what is meant by Climate Change? How has this changed in recent years?

To what extent is the consensus on climate change among scientists reflected in public opinion?

1.1 Despite an almost unparalleled scientific consensus on the main climate change issues and efforts to communicate these to the public, there is no equivalent consensus in public opinion. The chief reasons for this are psychological and political. Some of them are related to: 1) the time taken to form or change public opinion; 2) partisan politics; 3) biased or inaccurate media coverage (including that driven by the need for balance—giving equal air time to two competing opinions counts as balance even if the scientific community is 99% behind one of them); 4) psychological (temporal, spatial) distance from climate change causes and effects; 5) resistance to admit the need for behaviour change; 6) lack of empowerment; 7) prioritisation of other concerns and risks over climate change (economic, health, security, etc.).

Current state and changes in awareness of climate change in the UK

1.2 Overall awareness and concern about climate change has been increasing internationally, especially over the last decade. According to Defra (2002) there is almost universal awareness of climate change in England. This does not necessarily mean detailed understanding of the important aspects of climate change such as causes and effects, uncertainty and risk, impact and solutions. Nor does this necessarily correspond to behavioural change or support for policy measures on mitigation and adaptation to climate change effects.

1.3 In the last three or four years some decline in public interest in climate change was registered in a number of polls and surveys in several countries including the UK. Respondents in these surveys expressed higher levels of uncertainty or scepticism about anthropogenic climate change over the recent several years (Gallup, 2009; BBC climate change poll, 2010; Spence et al. 2010). According to Whitmarsh (2011) the number of British people believing that claims about climate change had been exaggerated almost doubled from 15% to 29% between 2003 and 2008. This increase in scepticism may be related to issues around the communication of scientific uncertainty to the public.

1.4 Believing the climate change message still allows some variance in certainty of the belief. The level of certainty in some groups of population can be affected by events and can change over time. For example, fluctuations in short-term weather conditions can affect public opinion. Rising scepticism can also be linked to the media campaigns and allegations of biased reporting by climatologists (eg "Climategate"). However, Scruggs and Benegal (2012) identify the economic recession as the main cause of the recent decline in public concern about climate change. They also suggest that concern will come back with improvements in the economy.

1.5 On a longer timescale the evidence from research on public understanding of climate change indicates widespread awareness and significant concern, but limited behavioural response corresponding to these beliefs.

1.6 The results of survey studies and opinion polls are often inconsistent, because the context and framing of the questions play a very significant role. Framing effects show small differences in the wording of questions or the context of surveys results in big discrepancies in the outcome. For instance when respondents are not provided with a checklist of causes, they demonstrate less understanding of anthropogenic causes (eg Norton and Leaman, 2004). Framing can affect not only self-reported perceptions of the respondents but also result in attitudinal and behavioural changes.

Ipsos MORI Survey, 2010 results

1.7. The survey conducted in January-March, 2010 by Ipsos MORI involved a representative quota sample of 1,822 respondents residing in England, Scotland and Wales (Spence, et. al., 2010). It found that:

- 78% of British respondents believed "that the world's climate is changing", with 8% reporting "not knowing".
- 89% of British respondents believed that human activities were playing a causal role in climate change.
- 41% of British respondents believed that they were already experiencing the effects of climate change.
- 71% of British respondents reported that they were "very concerned" or "fairly concerned" about climate change, with an additional 19% indicating some level of concern.

2. Which voices are trusted in public discourse on Climate Science and Policy?

Climate change discourse, the media and other voices

2.1 Climate change is a politicised debate involving conflicting interests and challenging societal and individual habits. The discourse on climate change is complicated by difficulties in communication between science, policy, the media and the public. There is space for miscommunication, resistance and politicisation at any stage of the discourse.

2.2 There are important differences in public understanding of climate change and trust in different countries, cultures, and social groups. However there are some common tendencies across these groupings. Traditionally science has been viewed by the public as the most trustworthy and the least partial source of information. The public usually receive scientific information indirectly, not through peer reviewed papers, but through the media. The media in general is a more diverse and popular, but less trustworthy source of information for the public. According to the Carbon Brief poll (2010), one of the most trusted media sources, the BBC, was considered trustworthy by only 31% of respondents and was considered untrustworthy by 25%. At the same time the media is a chief information source for driving rising public concern. There is a clear correlation between media coverage and public concern about climate change issues.

2.3 Overall the media involvement in the climate change debate has been inconsistent and controversial. Along with excellent reporting and efficient presentation of the climate change message there are many biased and ill informed campaigns in the media. Many common public misunderstandings about climate change can be attributed to the media. The media tends to be very selective in covering global climate change issues; it consistently exaggerates the uncertainty of science behind them, suggesting that it is "statistical fuzzy" (Dispensa & Brulle, 2003). Other problems with reporting climate change science include oversimplification and misuse of scientific language. Probably the biggest problem in media reporting is the mainstream media's strong link with political agendas. The increase in use of social media and online non-mainstream media sources, such as YouTube, creates an opportunity to provide accessible unbiased information; and a challenge in "controlling" the information and associated spin-off discussions.

Public trust in science

2.4 In comparison to other voices (such as from industry, government or climate activists) British people's trust in climate messages from scientists is significant. A number of surveys have shown that information attributed to a scientific source is trusted more than the same information attributed to government, industry or climate activist groups.

2.5 However, research shows that public interpretation of scientific information is greatly affected by societal values, personal experience, and other contextual issues—and hence can vary significantly across different

social groupings. People tend to be selective in noticing and accepting the evidence depending on how well the evidence can be integrated with their worldview and lifestyle.

Experts vs. public understanding of uncertainty and risk.

2.6 There is a discrepancy in understanding and using risk and uncertainty concepts in the scientific community and by lay people. There is very little uncertainty about human activity influencing the global climate among climatologists (according to Doran and Zimmerman, 2009, 97% agree). Nevertheless there is a large number of more specific scientific uncertainties, eg predicting the exact impact of climate change on a particular area or the effect of policy measures. There are also uncertainties related to the social or political consequences of climate change reflecting differences in personal values and political ideologies. Some of the inevitable debates and uncertainties expressed by experts and scientists are often misinterpreted by the public as a lack of certainty in anthropogenic climate change and therefore become a reason for scepticism by the public in climate change.

3. How could public understanding of what is meant by Climate Change be Improved? What are the main barriers to this? Does the media have a positive role to play?

The role of public engagement on climate change.

3.1 Climate change is an especially challenging issue because it is fundamentally linked to energy consumption, implying a need for a radical change in values, behaviour and institutions to address the issue (Lorenzoni, et al., 2007). This cannot be achieved without public engagement in climate change issues. Public and stakeholder engagement is important not only as a part of public participation in decision- and policy making in a democratic society, it is also crucial for achieving targets (eg CO2 reduction, energy-saving, etc.).

3.2 Public engagement can be defined as an individual state of connection and involvement in climate change with cognitive, affective and behavioural elements. These elements are not always fully reconciled with each other. In other words, climate change concern at a cognitive level might not trigger behaviour change; and more pro-environmental behaviour might be caused by economic incentives. Public engagement on all three levels is important.

3.3 The cognitive element or public understanding of climate change can be interpreted as awareness and knowledge of climate change issues. Understanding is important for any attitudinal and behavioural change in society; however the link between public understanding, perception of policy measures and behavioural change is not straightforward. Many preferences and behavioural changes are related to concerns other than climate change (eg economic and social interest, convenience, fashion, etc.). The discrepancy between awareness and interest in climate change issues with lifestyle and behavioural choices has also been noted by many researchers. Some social scientists think that scientific evidence about climate change related risks is actively "filtered" in peoples' minds. So that the public tend to accept only the evidence they find consistent with deeply held cultural values and reject evidence that challenges those values.

3.4 An affective element in public engagement can provide a personal connection with climate change issues and motivate behavioural change. Effective communication of "the" climate change message should also aim to engage on an affective level. This implies identifying different audiences and recognition of different methods of engaging them torepresent and frame the climate change science and policy issues in a way which has a personal and emotional relevance.

Framing effect

3.5 Seemingly small changes in presentation of information can significantly affect subsequent beliefs, attitudes and behaviour. This framing effect plays a vital role in communicating climate change science and policy messages. Thus framing can address one of the common barriers in climate change communication, the psychological distance effect. Analysis of public perception has indicated that climate change is perceived as distant on a number of different dimensions. People who reported overall concern about climate change issues often do not believe that climate change will effect them directly and personally. In support of this, research evidence suggest that people are more willing to engage when climate change issues are framed in terms of vulnerabilities on a local level. Connecting individuals and communities to potential direct personal impact gains traction when engaging the public in climate change issues across the full cognitive, affective and behavioural "divides" of engagement.

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April 2013

Written evidence submitted by EDF Energy (CLC032)

Executive Summary

— EDF Energy believes that a large majority of the public accept the view that the Earth's climate is changing, and most accept that human activity has at least some role in causing this. This is based on polling that we have commissioned.

— More recent evidence appears to indicate that the level of concern about climate change in the UK is rising again after a period of decline towards the end of the last decade. This is a trend that has also been observed in other developed countries. The increased level of concern appears to be linked to observed local effects rather than to a change in the understanding of the causes of climate change.

— It is our view that public attitudes to climate science do not have a significant effect on engagement with energy policies or initiatives. The challenge that exists with emissions mitigation measures is in maintaining public support for decarbonisation policies at a time when the wider economy is in a markedly different state to five years ago.

— EDF Energy believes that the Government should take a lead in enhancing public understanding, bringing together energy companies and consumer and environmental advocates in an effort to improve public understanding about expected trends in future energy bills and the reasons for upward pressures.

— In terms of policy development, it is important to recognise that the causes and detailed impacts of climate change are not always readily apparent and that the nature of the remedies and reliefs to mitigate climate change will need to work over a long time span stretching many generations. In these circumstances, we believe it is essential for the UK Government to work with Governments across the world to provide clear strategic leadership on this issue.

About EDF Energy

EDF Energy is one of the UK's largest energy companies with activities throughout the energy chain. We provide 50% of the UK's low carbon generation. Our interests include nuclear, coal and gas-fired electricity generation, renewables, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including both residential and business users.

EDF Energy's Response to your Questions

Q.1 *What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?*

1. Over the past five years, EDF Energy has commissioned YouGov to conduct annual polling on public perceptions of the energy challenges facing the UK. Part of this work has included measuring the levels of interest and concern for global warming and climate change.

2. The 2012 responses[48] confirm that a large majority of the public accept the view that the Earth's climate is changing, and that most accept that human activity has at least some role in causing this. Respondents were asked how seriously they view the issue of global warming and climate change—grading responses along a scale from "serious and urgent", to "believing it is not happening". The conclusions from the 2012 poll were as follows.[49]

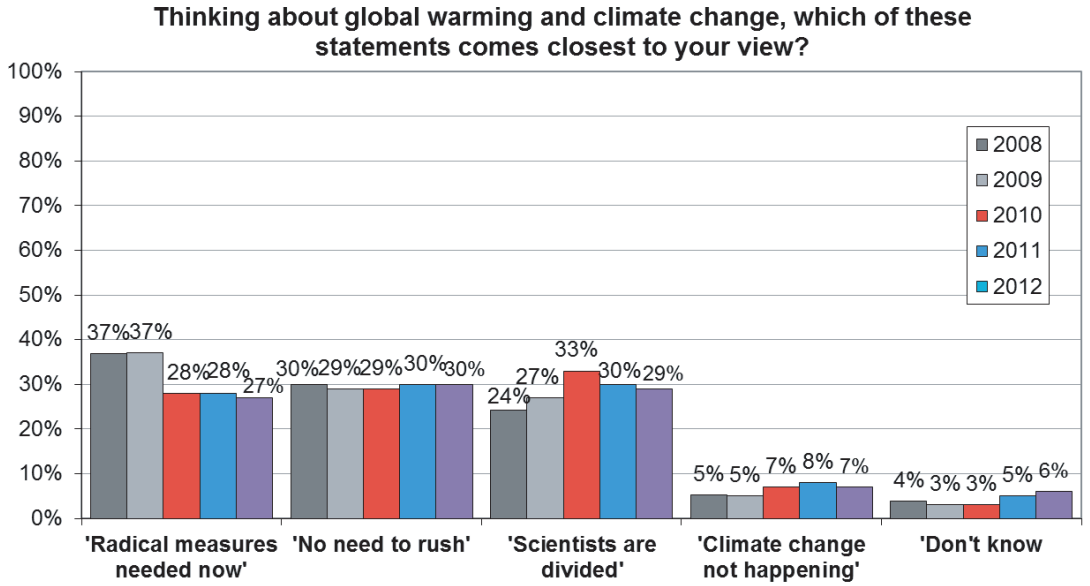
[48] EDF Energy Annual Poll 2012, YouGov, 6 July 2012
[49] Ibid., page 10

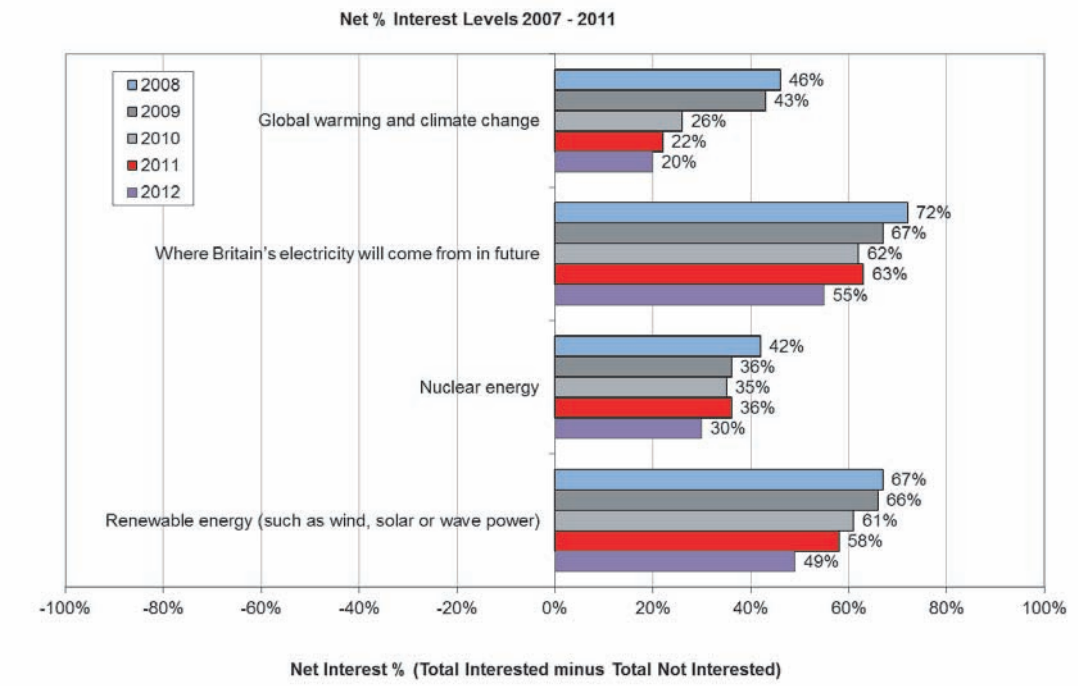
— Currently, 27% of British adults see climate change as a serious and urgent problem; 30% accept it is happening but do not think we need to act with urgency, 29% are unsure whether climate change is happening, and 7% do not believe it is happening at all.

— Older people are a lot more sceptical of climate change than younger people. 49% of over 60s either say they are "unsure whether climate change is happening" or they "don't believe climate change is happening at all".

— Conversely, only 21% of 18–24 year olds said one of these two statements.

3. The results tables below from the polling[50] show that views have remained fairly constant for all answer options with little change since 2009. However, the net percentage interest levels in global warming and climate change have decreased from 46% in 2008, to 20% in 2012.





4. However, we have also noted with interest the recent study of "Public Perceptions of Climate Change in Wales",[51] where over half the respondents (65%) considered that their local area is likely to be affected, and that Wales is already experiencing the effects of climate change. Respondents also expressed concern about the effects of climate change in developing countries and on the natural world.

[50] EDF Energy Annual Poll 2012, Fig 2.2 and Fig 3.1

[51] Public Perceptions of Climate Change in Wales, Stuart Capstick, Nick Pidgeon and Mark Whitehead, December 2012

5. The increased levels of concern appear to be linked to observed local effects rather than to a change in the understanding of the causes of climate change. In particular, the report demonstrated a clear link between respondents' experience of flooding, and concern about climate change.[52] It found that:

- 75% of respondents who had experienced property damage were "very" or "fairly" concerned about the effects of climate change on them personally, versus 56% of those who had not seen or experienced the effects of flooding.
- 89% percent of respondents who had experienced property damage were "very" or "fairly" concerned about the effects of climate change on Wales, versus 76% of those who had not seen or experienced the effects of flooding.
- 81% of a subsample of respondents living around Llandre, Ceredigion (a region of Wales flooded in the summer of 2012) considered that their local area is likely to be affected by climate change, versus 66% of the main sample.

6. The findings of both pieces of research demonstrate that public understanding and awareness of climate change remains reasonably high across the UK as a whole. However, evidence from the research in Wales suggests awareness can be significantly higher in local areas impacted by extreme weather.

Q.2 *Which voices are trusted in public discourse on climate science and policy? What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?*

7. No comment.

Q. 3 *How could public understanding of what is meant by climate change be improved? What are the main barriers to this? Does the media have a positive role to play?*

8. The "Public Perceptions of Climate Change in Wales" report also presented a number of open ended questions to respondents. Some of the most common answers received measure climate change in terms of observable, physical impacts. This included the effect on polar ice caps and sea levels, impacts on the weather and seasons, and changes to temperatures[53]. However, there is a risk that using such terms of reference may lead people to conclude that climate change is something that is happening far away from their locality, and to other people.

9. It is for this reason that the connection between observed local effects and an increased level of concern about climate change, as described above, is of potential interest. We believe that improved communication by the Government, media and NGOs about how climate change impacts the local area in which people live, and how it can be mitigated, can be a powerful driver of behaviour change.

10. However, there are clear drawbacks in such a localised approach as it is extremely difficult in many circumstances to identify specific local effects with a high degree of confidence or accuracy. In many cases, these effects may only crystallise after a long period of time (and in some specific local cases may be desirable). We believe it is essential for the Government and industry to work together and provide strong leadership on this issue. It will be important to consider the significant risks that communities across the world are exposed to.

Q.4 *How important is public understanding in developing effective climate change policy?*

11. Although public understanding of the direct effects of greenhouse gas emissions on climate is generally well developed, the understanding of the indirect effects on consumer energy bills of policy costs to reduce carbon emissions is less well understood. The recent policy impact report from DECC[54] has provided a useful starting point for communicating these issues to the public. In order to gain public support for ambitious emissions mitigation measures, it is essential that energy and climate change policy is developed in an integrated and cost effective way.

12. EDF Energy believes that the Government should take a lead in enhancing public understanding, bringing together energy companies and consumer and environmental advocates in an effort to improve public understanding about expected trends in future energy bills and the reasons for upward pressures.

13. It is also important that international agreements reached through the United Nations Framework Convention on Climate Change (UNFCCC) process are understood by the public, in particular the implications for domestic or EU emissions reduction schemes.

Q.5 *What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?*

14. In its 2012 report on "Consumer engagement with energy markets",[55]the Energy and Climate Change Committee expressed concern that consumers are disengaged from all of the factors driving energy policy and initiatives, and struggle to make the link between the two.

[52] Ibid., Section 2
[53] Ibid., Table 1
[54] Estimated impacts of energy and climate change policies on energy prices and bills, March 2013
[55] 5th report: Consumer Engagement with Energy Markets, ECC Committee, December 2012

15. EDF Energy agrees with this view. We see maintaining public support for decarbonisation policies at a time when the wider economy is in a markedly different state to five years ago as a major challenge. In a difficult economic environment, people tend to increase their focus on everyday problems such as the cost of living and job security. Consequently, climate science and energy policy concerns fall further down the list of priorities.

16. The EDF Energy Annual poll (YouGov)[56] illustrates the point well. It shows that 85% of respondents see the economy as a major issue for the Government, as opposed to just 46% considering energy policy to be of pressing concern. Given that current energy policy is one of the Government's main tools for delivering decarbonisation to address climate change, this demonstrates that consumers are disengaged from the issue of climate science and its impact on policy.

17. However, by contrast some climate change adaptation initiatives have seen a high degree of public and local engagement, by both private companies and Government departments, despite the economic environment. For example, the Department for Environment, Food and Rural Affairs (DEFRA) National Adaption Programme has been successful in creating enduring partnerships for managing local climate risks and impacts.[57] This shows that, in the right arena, climate science does still have the power to successfully drive engagement with policy and initiative.

Q.6 *Does the Government have sufficient expertise in social and behavioural sciences to understand the relationship between public understanding of climate science and the feasibility of relevant public policies?*

18. No comment.

Q.7 *Can lessons about public engagement with climate change policy be learned from other countries?*

19. No comment.

April 2013

Written evidence submitted by the Geological Society of London (CLC034)

1. The Geological Society is the UK's learned and professional body for geoscience, with more than 10,500 Fellows (members) worldwide. The Fellowship encompasses those working in industry, academia and government with a broad range of perspectives on policy-relevant science, and the Society is a leading communicator of this science to government bodies, those in education, and other non-specialist audiences.

2. We have not attempted to answer all the questions raised in the Terms of Reference for the inquiry, as most are outside the area of expertise of our Fellowship.

How could public understanding of what is meant by climate change be improved? What are the main barriers to this?

3. The science which informs public discourse on climate change tends to be dominated by a limited range of disciplinary approaches and evidence bases. There is a strong focus on atmospheric science, oceanography and predictive climate modelling, on present day observations, and on data from the recent past. The Royal Society's September 2010 report "Climate Change: a summary of the science", for instance, refers to data from the historical past, and from air bubbles trapped in ice cores up to 800,000 years old, but not to any older data. This is very recent in geological terms. The narrative of climate change which is communicated to the public by government and others is strongly shaped by this limited scientific framing, making it vulnerable to attacks on these aspects of the science base (as happened when email records at the University of East Anglia's Climatic Research Unit were made public, for example).

4. The geological record contains abundant evidence of how the Earth's climate has changed over hundreds of millions of years. This evidence includes direct and proxy data for ocean and atmospheric characteristics, including temperature, ocean acidity and oxygen levels, past ocean productivity, sea levels, and aspects of atmospheric composition including carbon dioxide concentrations in the atmosphere (for example from carbon isotopic analyses of marine sediments, or from analyses of fossil leaves and soils). This evidence base, and the geoscience which it underpins, is entirely independent of atmospheric modelling and data from the recent past. It shows that our climate has undergone many fluctuations over this time. On several previous occasions, including 55, 120 and 183 million years (Ma) ago, there have been rapid injections of carbon into the atmosphere, which have triggered significant changes in the climate. These included temperature increases of at least 5–6ºC globally (more near the poles) in the 55 Ma event, increased acidity and decreased oxygen levels in the oceans, increases in sea-levels and widespread species extinction. It seems likely that the source of the increased atmospheric carbon was the emission of methane from the collapse of methane hydrate deposits on the seabed, though the emission of carbon dioxide from massive emissions of lava in plateau basalts is a prominent possible alternative explanation. Such major environmental changes happened rapidly (over perhaps

[56] EDF Energy Annual Poll 2012, YouGov, 6 July 2012
[57] Climate Ready: Co-creation progress update and an invitation to respond, DEFRA, July 2012 (progress report)

hundreds or a few thousands of years), but the climate took 100,000 or more years to recover. Anthropogenic emissions of carbon since 1750 amount to perhaps a quarter to a third of that released in the 55 Ma event. Moreover these recent emissions are happening very much faster—by a factor of at least ten—and will continue for several decades at least, however successful global attempts to reduce them may be.

5. Ice cores dating back as far as 800,000 years contain bubbles of trapped air from which it is now clear (as of early 2013) that carbon dioxide increased at the same time as temperature during periodic warm intervals. The rates of increase of carbon dioxide then were 10 to 100 times slower than the rate of increase over the past 100 years.

6. It is thus clear that on timescales of millions of years as well as on timescales of tens of thousands of years, carbon dioxide and temperature have changed together, and basic physics suggests that there is good reason to think that the two are connected—that is, that the rises in carbon dioxide have played an important role in driving up the temperature.

7. These various geological data allow us to calculate the climate sensitivity of the atmosphere to a doubling of CO_2 independently of climate models. The fact that the climate sensitivity calculated from observed geological data matches quite well that calculated from climate models lends credibility to these climate models.

8. The Geological Society published a public statement on the climate change evidence from the deep geological record in November 2010 (see http://www.geolsoc.org.uk/climatechange), which was prepared by a working group of geoscientists with a wide variety of relevant expertise.

9. Paying greater attention to this (independent) disciplinary approach to climate change science and evidence, and developing alternative narratives of environmental change which draw on it, has the potential to deepen public understanding of climate change, and to add resilience to efforts to build the trust of the public and engage them in efforts to reduce carbon emissions nationally and globally. It is often said, for example, that in continuing to emit carbon at current levels, we are running an unprecedented experiment on the Earth system. A more fruitful approach might be to highlight the natural analogues for this experiment that have occurred in the geological past, like the 55 Ma event. The key question to be asked is—are we now recreating conditions like those that led to the 55 Ma event?

10. There is also scope to improve engagement between climate modellers and atmospheric and ocean scientists with knowledge of evidence from the recent past, on the one hand, and geoscientists whose expertise relates to the deep geological record on the other. The design and parameters of predictive models used to forecast future scenarios, based on current observations and data from the recent past, should draw on evidence and research relating to rapid climate change events in the geological past to test and improve their performance. This kind of research is increasingly taking place and should be further encouraged.

11. Even better understanding of climate change in the past will result from greater investment in sampling the pertinent geological record—mostly that hidden either in ice cores or in deep ocean sediments where deep ocean drilling or piston coring is required to collect the materials required for analysis.

12. We would be pleased to discuss further any points raised in this submission, to provide material or suggest experts on evidence in the geological record relating to climate change, or to provide any other assistance we can as the inquiry progresses.

April 2013

Written evidence submitted by John Gahan (CLC035)

1. *A public understanding of what is meant by climate change amounts to what is aired by the broadcast media and what is written in newspapers. Our temperate climate tends to fool the public at large, especially the young, since they have no historical concept of how temperate climates work, and that climates are ever changing. The impression is that public opinion has altered dramatically in recent years towards a more sceptical society. This is probably due to wide variability experienced in a typical U.K. climate, sometimes too hot and dry, sometimes too cold and wet with changeable seasonal precipitation. While public opinion has changed, public service broadcasting (The BBC) has not, and continues with a rather biased AGW agenda.*

Analysis & Commentary

The question is does man-made (industrial) carbon dioxide together with natural inputs bring about global warming or climate change? This is understood to be the case by many politicians (some) climate scientists and seemingly the public at large. Discharge to the atmosphere of CO_2 gases due to the "burning" of fossil fuels, thereby said to exert global warming, is known as Anthropogenic Global Warming (or AGW) in science circles—or do environmental changes occur because of other factors currently being investigated?

Firstly, contentious claims that CO_2 is the major cause for global climate change, is based on historical laboratory experiments (a closed system) carried out in the mid-1800s. Today this assertion is hotly disputed by a very large body of scientists commonly referred to as climate sceptics. The conclusion arrived at is that

AGW is a false hypothesis derived from years of geophysical understanding of the scientific *modus operandi*, and scholarly interactions with leading scientists in the field of climate physics. This also stems from observational evidence that CO2 is a minor heat radiating trace gas common to the atmosphere, yet curtailed by a relatively short residency times (two to five years). Hence it is highly unlikely to affect global temperatures in the manner proposed. Additionally CO_2 comprises a negligible quantity of the molecular mass in our atmosphere, and currently amounts to 0.0396.8 parts per million by volume (ppmv—CO_2.Org Feb 2013). But it is still alleged to constitute the prime so-called "greenhouse gas" (GHG) thereby engendering a so-called global "greenhouse effect" (GE), said unequivocally to be responsible for climate change regardless of its source (industrial/natural).

With the quality of carbon dioxides forcing effect on climate warming (subscribed to by the AGW orthodoxy), it is neither challenged, nor made clear, that atmospheric gases, especially CO_2 is calibrated using a logarithmic scale. This gas does not absorb infra-red radiation over a linear range as many climate scientists mistakenly believe. Because CO_2 is strongly logarithmic in magnitude (a measurement that displays the value of a physical quantity using intervals corresponding to orders of scale), the first 1.5ºC of molecular CO_2 arises from the initial 20ppm. The next 1.5ºC increase requires a further 400ppm, and then 1ºC for a further 1000ppm. The significance of this is that with current levels put at ~0.039%, a one 100ppm increase will amount to ~0.1ºC warming after 50 years and less so with each added 100ppm increment. Or put another way, assuming a rising rate of 2ppm per annum (IPCC), temperatures will rise at 0.1ºC for every 50 years.

Furthermore CO_2 forcing can only be radiated over a tiny portion of the infra-red (IR) spectrum, ie within a 15 micron bandwidth only. Gaseous H_2O (water vapour) on the other hand (~4% of all atmospheric gases) is measured similarly but over almost the entire bandwidth spectrum. Therefore it is unscientific, nay impossible that anthropogenic and natural carbon dioxide gases coalesced together (or separately) can be responsible for climate warming. Not only is this gas insufficient of itself to account for a projected high degree of additional temperature escalation (2.4 to 6.4ºC) by the end of the twenty first century (AR4 2007, IPCC). But even with the inclusion of more dominant GHGs (H_2O, CH_4) that contribute mainly to the mass of our atmosphere, such large increases in warming are seen to be unattainable. Given the best climate scientists, they cannot predict future warming trends with any accuracy or indeed the amount of carbon dioxide that is said to contribute to it. It is well understood that atmospheric CO_2 follows (is not responsible for) warming over historical time-frames, but acts in reverse—atmospheric carbon dioxide follows warming, albeit somewhat belatedly over-time. (hundreds of years). This trend points to gradual rises in temperature following the last Ice Age ~10k years ago and suggests we might be entering one of many interglacials during the current Ice Age. Interestingly researchers at Berkeley National Laboratory (Jan 2012) have found that newly discovered so-called Criegee biradicals molecules react to accelerate the formation of sulphate and nitrate in the atmosphere. It is suggested these compounds will lead to aerosol formation and ultimately to cloud formation with the potential to cool the planet rather than warm it.

However, the hottest climate "science" innovation used by climate science institutions, is defined (guessed at) using specious modelling techniques (built-in projected undefined feedbacks). The end results of which provide nourishment for political consumption in IPCC reports. It can be said that hitherto temperature ratios have not increased beyond 0.7ºC from ~150 years ago. This is as one would expect given well researched observational data, although vested interests will state otherwise—mention "climate change" for funding research grants and you are more than likely to get them!

2. *Official pronouncements should always be trusted in public discourse by Government departments ("the voices") and must balance AGW rhetoric (from strident pressure groups and pseudoscience institutions) with balanced and clear directives. Moreover they should act only on thorough scientific evidence, and not be duped by consensus or none evidential viewpoints.*

Commentary

Tendentious pseudoscience has been laid bare by the so-called "Hockey Stick" diagram that first appeared in science literature and the public media in 2008—"The Hockey Stick Illusion" (2010) and additional literature opposing AGW issues. This was followed a year later by the "Climategate affair" that exposed the same institutions and so-called "climate scientists" transgressing their responsibilities to science ethics. The climategate revelations were a seminal moment that reinforced deep scepticism of science everywhere. It became patently clear that not only were some science institutions seen to be apostate to science principles, but that the "science" conducted was corrupt to its core. Worse was to follow when a committee tribunal exonerated the protagonists with a "pseudo-judicial" ruling (by a chairman with AGW leanings) without due reference to the mendacious behaviour employed by the protagonists themselves in altering and obliterating their "research" and presenting it as authentic science. Moreover, our public broadcaster the BBC, contrived by all means possible' to silence any opposition to these AGW "researchers" and the shabby science that followed from it. In fact the BBC went out of its way to commend this "dodgy data" based on the contrived Hockey Stick illustration and without probing comment expected from a public broadcaster. This was backed-up with a documentary series (Earth: The Climate Wars, 2010), while elsewhere their medium persisted with (an unbalanced) AGW agenda at every opportunity. Indeed it could be said; the BBC legitimised the Hockey Stick author (Prof Michael Mann) with prime-time (celebrity "scientists") in radio and TV appearances that went essentially unchallenged in contravention of its editorial standards—to this effect underpinned by Royal

Charter. Not only is the U.K. a democracy underpinned by fundamental rights for detracting opinions, but the BBC funded by licence fee payers has no mandate to adopt partisan strategies as to what, in their opinion, is correct and good for us.

3. *A public understanding of climate change and how reporting it could be improved, should call to account public funded broadcasters (the BBC) and related media outlets, with recognition that sceptical and opposing viewpoints, to say the AGW consensus, cannot be suppressed. All controversial issues must be articulated and debated together with balanced programming in easily understood lay terms—much the same way that the BBC is very good at, but alas has been venerating and extolling an AGW agenda for more than a decade now.*

COMMENTARY

From time-to-time there has been a good deal of correspondence with the BBC and BBC Trust, principally as a long term licence fee payer/s, to remind the power-that-be, that in almost every broadcast (regardless) via radio or television on their pervasiveness to plug the AGW agenda without balancing the topic with opposing viewpoints. Their response has been in the standard form:

"The BBC has held a high-level seminar with some of the best scientific experts and has come to the view that the weight of evidence no longer justifies equal space being given to the opponents of the AGW consensus"

Or to be concise "The science is settled"—tough! Well needless to say, as a practitioner (now retired) in geophysics, (the) science is never settled. Hence much laboured correspondence took place with the Corporation and Trust as to who these "best scientific experts" might be. Disquieting to report both organisations refused to name the scientists involved despite insistence that it was their duty to do so under the terms of their broadcasting mandate and for reasons of public transparency. It transpired however, following a rejected Freedom of Information request (FOI), from another (unknown) licence fee payer, that the FOI could not be disclosed in a High Court action. The judgement related to some obscure edict; citing dismissal of the action on behalf of the defendant (the BBC) in contention that "for the purposes of journalism" it could not be granted—a rather inadequate get-out clause, notwithstanding an iniquitous waste of licence fee funding it seems—again it later became known the sentencing judge was a member of a pro-AGW pressure group. However an intrepid blogger utilising the internet's archival Wayback Machine discovered that 58 persons attended a seminar in 2006 supposedly representing a scientific gathering of minds on behalf of the BBC—forming as it happens, the Corporation's scientific gathering. These attendees were in fact the BBC's "best scientific experts". The names and representations revealed most attendees were none other than AGW campaign groups (Greenpeace, Stop Climate Chaos, etc) plus 28 BBC employees and some representing NGOs, but most coming from industry and vested interests groups. In fact only three scientists attended the seminar, none of whom was qualified in attribution science associated with Earth sciences or climate physics. It was revealed the meeting was organised by the new BBC Director General (March 2013), Lord Hall, who was then, Mr Tony Hall, the Director of News—perhaps an opportunity here now to redress past editorial imbalances? We shall see!

4. *A public understanding is vitally important in developing effective climate change policy. For example parliamentary climate change minister/s should be eager to understand the nuances of how science works and be readily disposed to listen to opposing/sceptical arguments whether for or against related issues. Rather than, as at present, adopting out-of-hand AGW policies (unwittingly?) that are hurting household energy bills for the want of a clearly defined energy policy in the interests of the electorate, and not to satisfy noble cause politics.*

COMMENTARY

When in post it was clearly apparent that Chris Huhne (Coalition, LD) was a vocal AGW environmentalist, as was David Milliband (Labour) before him, another strident AGW supporter. Both had poor/no understanding of climate science issues other than the benign consensus viewpoint, whose intent is lofty noble cause principles at the expense of adapting to climate changes, if indeed such is occurring. None of the past ministers were qualified in science training, nor indeed is the current incumbent, Ed Davey (LD)—all it seems hold PPE qualifications from the same red-brick university. Moreover none has ever been employed outside of academia or worked in the "real world". The current Environment Secretary is seemingly enacting a coalition initiative clearly designed with energy policies that could be rightly called the "Green Mix"- a strategy clearly intent on utilising a combination of renewable energy resources, such as wind turbine, solar panel and tidal surge. Such "green" policies thus far have cost/is costing millions of pounds of tax payer funding by way of Government subsidies, no doubt designed to appease the minority (yet strident) green lobby. However it is well known that manufacturing costs of wind turbines are extremely high while the U.K's chaotic variable wind speeds make their use largely inefficient and costly to maintain or replace. The evidence/research points to a huge imbalance of operating margins that is leading to rising energy prices from an unworkable misguided environment policy. As for solar power in our changeable climate where winters are long, cold, dark and damp and when power is most needed, they are again singularly costly and inefficient because insolation is highly variable. And like most renewable energy sources the electricity generated is unable to be stored thereby delimiting downloads to the National Grid.

On the inevitable concern of utilising nuclear power, well this is one of the most proven and reliable sources of energy, albeit associated with initial high build, maintenance and safety costs. The conundrum still exists however; "what is to be done with nuclear waste?" As for safety issues generally, well the industry as a whole tends to be (extremely) safety conscious following Chernobyl (1986) and Fukushima (2011)—a natural unforeseen catastrophe. Sad to report a U.K. nuclear power programme by necessity should have been addressed (by successive Governments) many years ago with a rebuild/modification programme projected fifty to perhaps a hundred years ahead—but today is still in wanting because of restricting AGW laws/guidelines that result in continued inaction.

5. *As alluded to elsewhere, the Government appears not to seek or acquire sufficient expertise in climate science, yet continues to follow a green agenda leading to injudicious policies. When it deigned to invite a sceptical climate expert last year (Prof Richard Lindzen—lecture House of Commons, Feb 2012), no parliamentary follow-up ensued. The forward-thinking blogosphere and some media outlets were enthusiastic and hopeful of a radical turnabout on current policy, but this authority on climate change science was again (House of Lords, Jan 2005) neglected or ignored.*

COMMENTARY

A wealth of insight and knowledge on climate science has been ignored by politicians, the media, and especially AGW scientists following their own (CO_2) agenda. Vast amounts of new research by Earth scientists, astrophysicists, cosmologists, climatologists and other disciplines is today available from easily accessed websites and institutions. Much information is still being researched but what is available has been made accessible on the internet which attempts to address all known (and unknown) variables relating to climate science. In just a few examples, a well informed paper of climate modelling/residency times and AGW CO_2 on the origins and proficiency of GE global warming is available from Professor Segalstad (1997) together with impartial independent studies, such as website http://brneurosci.org/co2.html (click Global warming) which is highly informative. Such balanced studies from many Earth and climate physicists foretell of variable factors (too many to discuss here) that point to warming and cooling episodes over shorter time spans than was previously envisaged in addition to episodically longer periods of warming/cooling deduced from the geological record.

Further studies (readily accessible) include the influence of Heinrich Events (sedimentary marine core data), D-O Cycles (ice core data), and Milankovic Cycles (Solar system planetary cycles). Solar insolation alone amounts to 99% of warming and radiative forcing at the Earth's interface where warming phase transitions release CO_2 from natural sinks to the atmosphere in relatively short-term (hundreds of years) following temperature increases. Simple experiments demonstrate that solar irradiance cycles and industrial carbon (fossil fuels) contribute miniscule amounts of life-giving CO_2 to the atmosphere. Insolation is the driving mechanism of all atmospheric heating captured (to a greater extent) by a "Blanket Effect" rather than (a misnomer) "The Greenhouse Effect". Furthermore the atmosphere is an open system and does not have a ceiling, where all atmospheric heat is ultimately lost (disseminated) to the vacuum of space. And having researched the impact of atmospheric CO_2 ^{gases} for many years, there is no scientific evidence whatsoever that carbon dioxide is uniquely responsible for inducing global warming (climate change)—regardless that there is a correlation of nominal warming (thermal infra-red) in all GHGs (H_2O, CH_4, C_{O2}) and a dilution in others (N, O, & $O_{3)}$. A correlation with something else however cannot be regarded as science fact as many might believe.

Indeed the CLOUD project currently under investigation at CERN relating to heavy electron bombardment (muons) due to idiosyncratic variation in solar flares (coronal mass ejections) seems to offer a better understanding of (perhaps) shorter term climate change based on solar irradiance. Current (known) climate influences fail to persuade many scientists (the sceptics) that CO_2 (a minor thermally reactive gas) is the prime driver of global warming (climate change).

6. *Yes lessons can be learnt by public engagement with climate policy, especially from other countries. Examples have been provided in this testimony to the closed mindset of many politicians, some scientists, and parts of the media and public alike. Countries such as India and China reject outright any global treaties on limiting atmospheric carbon dioxide emissions (Bonn & Copenhagen Climate Change Conferences), while other countries such as Canada, Russia and Japan pulled out of the Kyoto Protocol (1997) in 2011, because their economies are thought likely to stagnate under, what could be said, iniquitous and unrealistic carbon targets that science tells us can never be implemented.*

COMMENTARY

India and China emphasise an overriding priority of maintaining high economic growth rates to raise living standards. Their plans identify measures that promote development objectives while also yielding co-benefits for addressing climate change effectively if possible. Both agree national measures would be more successful with assistance from developed countries, and pledge that per capita greenhouse gas emissions will at no point exceed that of developed countries even if pursued with development objectives. In other words their own economies must come first, with a tacit understanding that atmospheric carbon dioxide levels cannot be controlled by the developed world, and anyway the AGW science is suspect and not proven.

In 2011 Japan and Russia stated that they would not take on further Kyoto targets. The Canadian government invoked Canada's legal right to formally withdraw from the Kyoto Protocol in December 2011. Canada was committed to cutting its greenhouse gas emissions to 6% below 1990 levels by 2012, but in 2009 emissions were 17% higher than in 1990, while warming remained static. The Environment minister cited Canada's liability to "enormous financial penalties" under the Kyoto treaty unless it withdrew. He also suggested that the recently signed Durban agreement may provide an alternative way forward. Canada's decision was strongly criticised by other ratifying countries.

N.B.

On a topical but sad note following the death of our former Prime Minister, Baroness Lady Thatcher ("The Politician"), she was greatly responsible during the 1980s for adopting an AGW agenda. This course of action was taken-up by most developed countries because of her symbolic status in the world of politics. On further investigation however during her retirement, Lady Thatcher ("The Scientist") renounced the AGW Theory by referring to it as "highly suspect"; and to activists motives as "doomsters"- *"Statecraft" (p449–458) (Harper/ Collins 2002)*

More of this treatise could be expanded upon but is limited in word number by STSC Committee diktat.

April 2013

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Written evidence submitted by Brian Gallagher (CLC037)

1. Initially, I mistook the purpose of this exercise for an open-minded investigation. However, the wording plainly suggests the objective is public opinion manipulation—not what is expected of an evidence based, objective science project. I mean no disrespect to Committee Members but this does not get things off on the right foot.

2. This is what I mean: Foresight cautions that "should scepticism continue to increase, democratic governments are likely to find it harder to convince voters to support costly environmental policies aimed at mitigation of, or adaptation to, climate change."

3. There is an urgent need for the Science and Technology Committee (ST&C) to understand that growing numbers of the electorate who have taken the trouble to inform themselves on climate and energy/power are well aware of the disconnect between what is unsubstantiated theory and what is observably plausible and capable of verification.

4. I am sending these thoughts directly to ST&C Members because this will likely be a box-ticking exercise based on a pre-conceived outcome with "sceptical" feedback discarded irrespective of relevance. When even respected parliamentarians find it difficult or impossible to influence a return to proper debate, ordinary members of the general public (as I am) feel disenfranchised. I do not make these points lightly. The subjects at issue here are of fundamental importance for all Britons ... and it is like watching a slow motion train crash.

Climate

5. Those wanting balance in their understanding of climate and power cannot rely on the likes of the BBC which, in violation of its own Charter, chooses not to report what is at odds with its warmist agenda. That leaves the inquiring individual to seek credible "alternative" sources elsewhere which, fortunately, are plentiful. Scientific advances depend on scepticism. The promotion of a rigid establishment pseudo consensus and the branding of "deniers" is the kiss of death for progress and enlightenment.

6. This 20 April page is a case in point http://bishophill.squarespace.com/blog/2013/4/20/the-low-carbon-fairy-story.html It concerns the House of Commons Energy and Climate Change Committee and Peter Lilly

MP. ST&C Members will see a number of books written by climate and power realists on it. There is also an extensive list of science and political blogs which provide the essential balance lacking in mainstream ideology.

7. Look at reader comments following any Christopher Booker climate or power article to gauge an important slice of public opinion. Put at its simplest, this is my position and that of most people I know. It is completely illogical for the AGW theory to be portrayed as "settled science". It is a theory—nothing more. Global warming stalled in the late 90s and even the Met Office acknowledges none is expected in the foreseeable future. This firmly undermines the asserted correlation between Co2 and rising temperatures. The increasing but tiny Co2 concentration is essential for crops and life on earth. It has been up to 20 times higher in the past without catastrophe. It is a benign gas. The weasel words Climate Change will not do. Climate has always changed cyclically and always will. What are being termed "extreme" weather events are a part of it.

8. The effects of sunspot activity and atmospheric water vapour feedback are not well understood. Until they are, there is no honest possibility of even theoretical scientific conclusions nor adequate computer modelling. The elephant in the room is a Mini Ice Age. The present Holocene interglacial is showing disturbing signs of ending. The ST&C should take full account of astrophysicist Piers Corbyn's findings and other scientists who agree with him. To focus on warming theory to the exclusion of this distinct possibility is irresponsible.

9. Increasingly, people are distinguishing between agenda driven efforts to convince them of a non-existent "consensus", as distinct from rigorous science free from spin. That is at the heart of mounting scepticism—not any lack of misguided "PR communication". The revealing attachment is but one of many in a similar vein which renders the "settled science" assertions distinctly disingenuous.

Energy/Power

10. Just about everyone I know recognises that wind isn't working. Turbines generate a) plenty of money for the few at the expense of the many b) fuel poverty c) property blight d) tourism blight e) bird and bat destruction by the million globally f) the need for constant conventional backup because they are so inefficient (so no Co2 reduction) g) ill health (particularly chronic sleep deprivation) which the NHS doesn't need. When will there be a proper epidemiological study to confirm the growing weight of medical observation? h) miles of costly, countryside-disfiguring pylons to carry the dribble of intermittent power from remote sites to centres of population—by which time transmission losses have reduced it further j) significant seabed environmental disturbance k) offshore maintenance nightmares for blade breakage, gearbox failures etc during the majority of time wild sea conditions make servicing impossible k) waste running into £billions each year l) an absurdly generous bonus for operators when turbines need to be switched off m) grid de-stabilisation n) serious peat bog disturbance (for turbine foundations) causing release of immense amounts of Co2. o) the realisation that turbine output load factor of about 25% at best declines within 10 years and real world life expectancy is about 12 to15 years not 25 years p) imminent risk of blackouts.

11. Wind output data from http://www.bmreports.com and other sources reveals what dire "value" for money the fitful output is. That is setting aside the subsidy cost doubling cost for onshore turbines, triple for offshore and the devastating effect on competitiveness which is driving businesses away from the UK. The fictional touted "green job" creation has been discredited by the Spanish experience. At a time of severe austerity, blowing £billions on a futile gesture is monumentally senseless. China, India, Germany and the rest are adding coal power stations at a rate which dwarfs any UK "aspirations".

12. For power realism, Profs Ian Fells and Dieter Helm will set the record straight—as can any good electrical engineer working at the generation and distribution "coal face".

Conclusion

13. On the one hand there is the IPCC (set up to promote warmist ideology, not to determine the balance of scientific probability), Profs Michael Mann, David King and John Beddington, Drs Steve Jones and James Hansen. the Met Office, Al Gore, Tim Yeo, John Gummer, Ed Davey and the BBC. On the other are Profs Richard Lindzen, Fred Singer, Nils-Axel Mörner, Freeman Dyson, Bjorn Lomborg, Kiminori Itoh, Ivar Giaever, Will Happer, Ian Plimer, Patrick Michaels, and James Lovelock, Drs Sallie Baliunas, Willie Soon and Alan Carlin, Nigel Lawson, AW Montford, Steve McIntyre, Ross McKitrick, Anthony Watts, Christopher Booker, Matt Ridley, Roger Helmer, and Struan Stevenson.

14. For me it is no contest because it's between political, financial, ideological, and funding conflicts of interest against something without an axe to grind—transparent and in the public interest.

15. Sad to say that apart from a possible acknowledgement, I don't have high hopes for engagement or any indication that what I have written has been absorbed, still less acted upon, but at least I'm not sleepwalking into the climate bear trap and looming power disaster. However, perhaps there is a glimmer of hope in this 16 April Daily Telegraph piece so long as we abandon the "leading the world to greenness" make-believe.

16. "The European Union's climate change policy is on the brink of collapse today after MEPs torpedoed Europe's flagship CO2 emissions trading scheme by voting against a measure to support the price of carbon permits. The price of carbon crashed up to 45% to a record-low €2.63 a metric ton, after the European

Parliament rejected a proposal to change the EU emissions-trading laws to delay the sale of 900m CO2 permits on the world's biggest carbon markets. —Bruno Waterfields, The Daily Telegraph, 16 April 2013"

17. Out of interest. might I ask how many ST&C Members have studied any of the following? I ask because the so-called orthodox position has received saturation coverage, but it seems to me reaching an informed position on these matters sufficient to consider policy is dependant on familiarity with all the issues even if some are "inconvenient truths".

The Hockey Stick Illusion, Climategate and the Corruption of Science—AW Montford

The Propaganda Bureau—AW Montford

Hiding the Decline—AW Montford

Climate: the Counter-consensus—Professor Robert Carter

The Climate e-books of Joanna Nova at http://joannenova.com.au

The Age of Global Warming, a History—Rupert Darwall

The Wind Farm Scam—Dr John Etherington

So Much Wind: The Myth of Green Energy—Struan Stevenson

FOOTNOTE

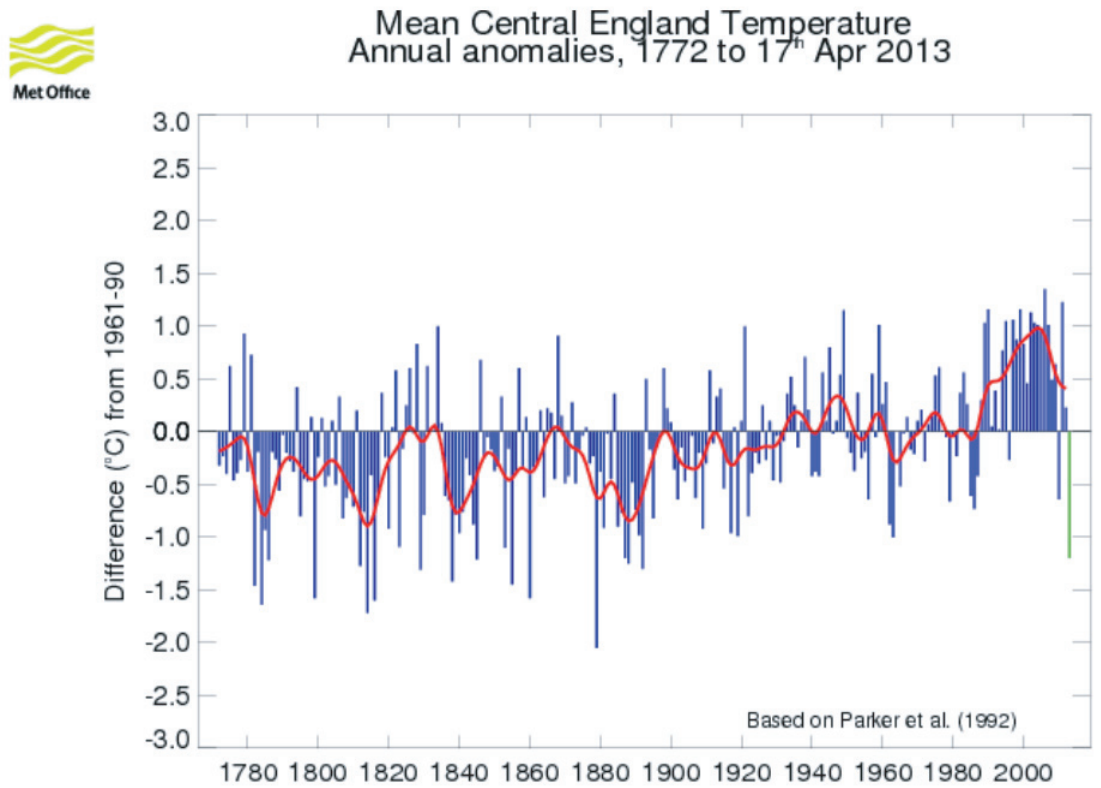
18. Greenpeace activist Baroness Worthington's role in the 2008 Climate Change Act ("the most expensive suicide note in history"); circumstances allowing her to "get away with it" and the distinct lack of political realism/opposition to it should not be forgotten when jaundiced views of the electorate are considered.

Declaration: I am a member of the general public and have no interests to declare either political, financial, ideological or funding related.

April 2013

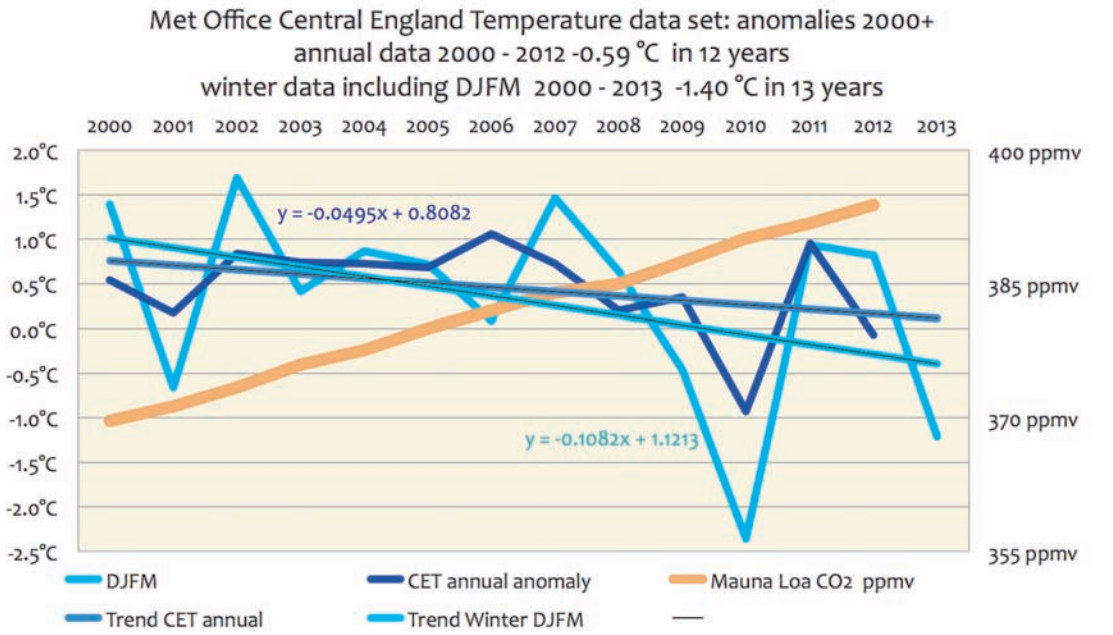
Temperature change in a Nutshell

The UK Met Office long term Central England Temperature record[i] has kept a continuous and consistent data set since the 1660s. It appears to be reliable and to have maintained its quality. It has not been adjusted as have so many other official temperature records.



Although the CET record covers only a small part of the northern hemisphere, it has shown a consistent rise since the end of the little ice age in 1850 at a rate of about +0.45°C/century or about +0.67°C in the last 150 years. This rise accords well with other temperature records.

However since the year 2000, diminishing solar activity in solar cycle 24, moving back towards little ice age patterns, appears to be having an real effect.

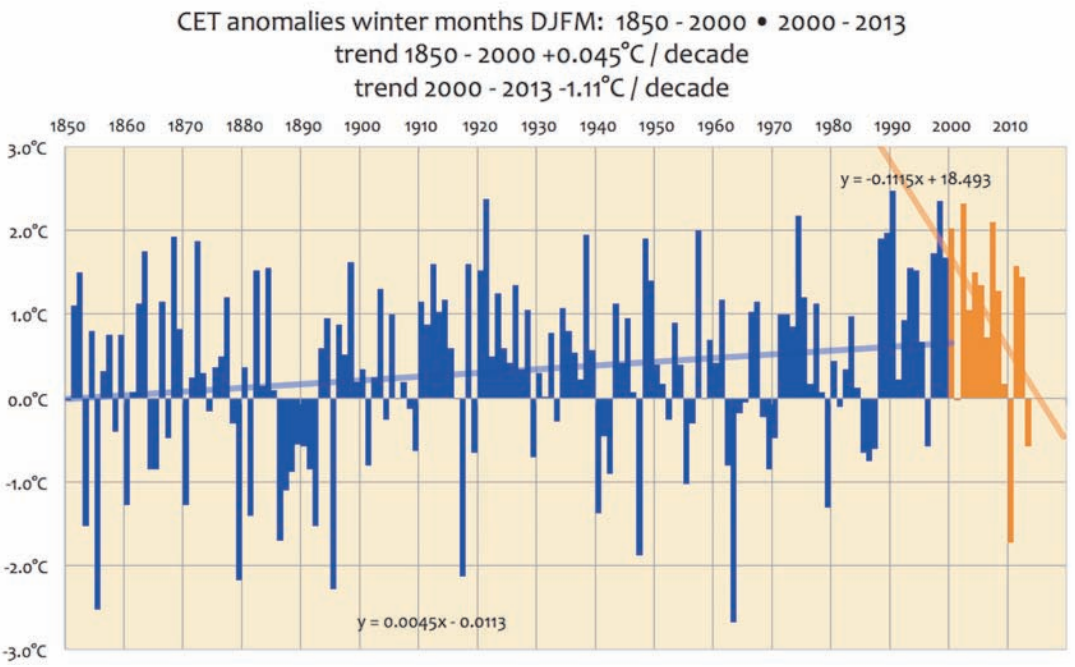


So since 2000 the CET shows an annual temperature diminution at the rate of -0.49°C/decade or -0.59°C in 12 years: this negates ~80% of the entire CET temperature rise since 1850. Although this is a very short period, the extent of the climate change that has been observed since the turn of the millennium is remarkable.

Using the March 2013 CET value it is possible to show the winter temperature values up until March 2013 with a combination of the four months December—March for the first 13 years of this century. The diminution of the four winter months temperatures is more remarkable at a rate of -1.11°C/decade or -1.49°C in the last 13 years. This compares with a winter temperature increase rate from 1850 to the year 2000 of +0.32°C/century or +0.48°C for the whole 150 year period.

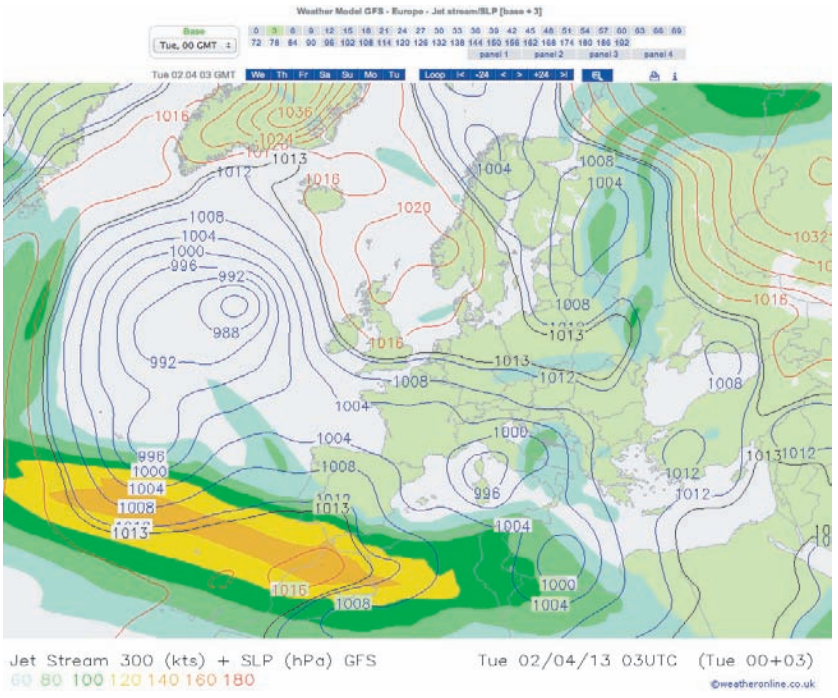
There are substantial shorter term fluctuations in temperature and since about 1850 world temperatures have been recovering from a Little Ice Age up by about +0.7°C up until the year 2000. These fluctuations have correlated well with solar activity observable by the number of sunspots. There was a particularly active solar period from about 1970 onward coinciding well with sunspot cycles 21–22–23: it lead to comparatively rapid warming.

However the current cycle 24 is very much weaker and sunspots are diminishing to the levels of the earlier Little Ice Age.



According to the astrophysicist Piers Corbyn,[ii] well renowned for the quality of his medium to long term forecasting, "so begins a Little Ice Age".

Piers Corbyn reports that these colder conditions lead to a southwards diversion of the Jet Stream over Europe, as could be seen on 2 April 2013,[iii] when the upper atmosphere air flow was passing over Northern Africa, rather than as was normal in warmer times to the North of Scotland.



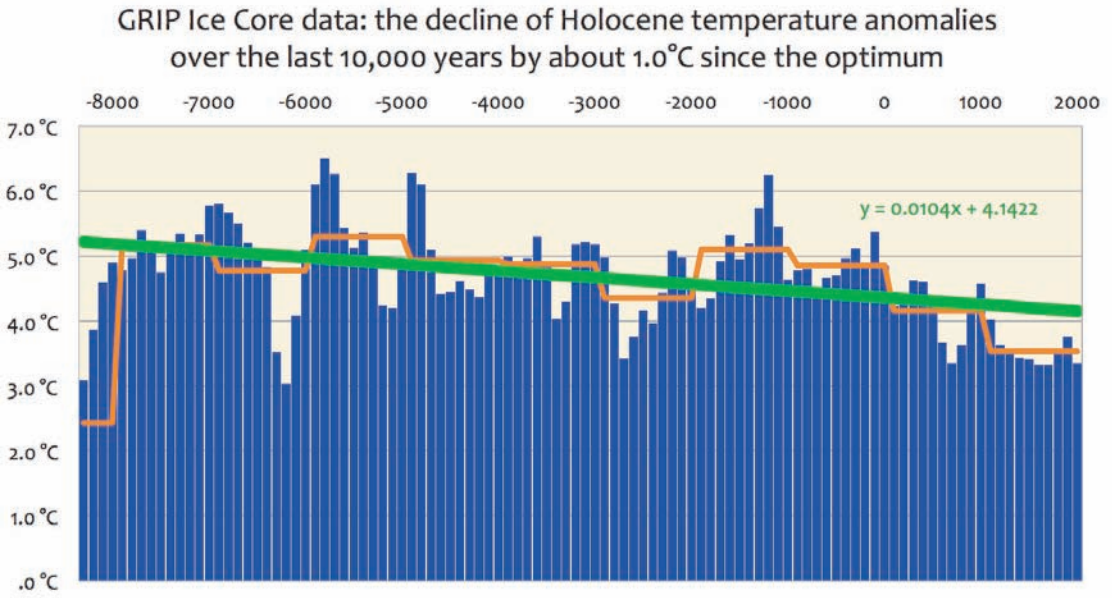
Such a jet stream pattern leads to very wet summer conditions and remarkably cold winters as have occurred in the last five years throughout Northern Europe and the rest of the Northern hemisphere. This adverse colder climate could well persist for several 10s or even hundreds of years as it certainly did for the pervious Little Ice Age.

Humanity has thrived in our current Holocene interglacial world. The comparatively warm last 10,000 years have been responsible for the development of the whole of civilisation. The GRIP[iv] Greenland ice core data, supported reinforced by several other similar long term ice core records show this effect very clearly.

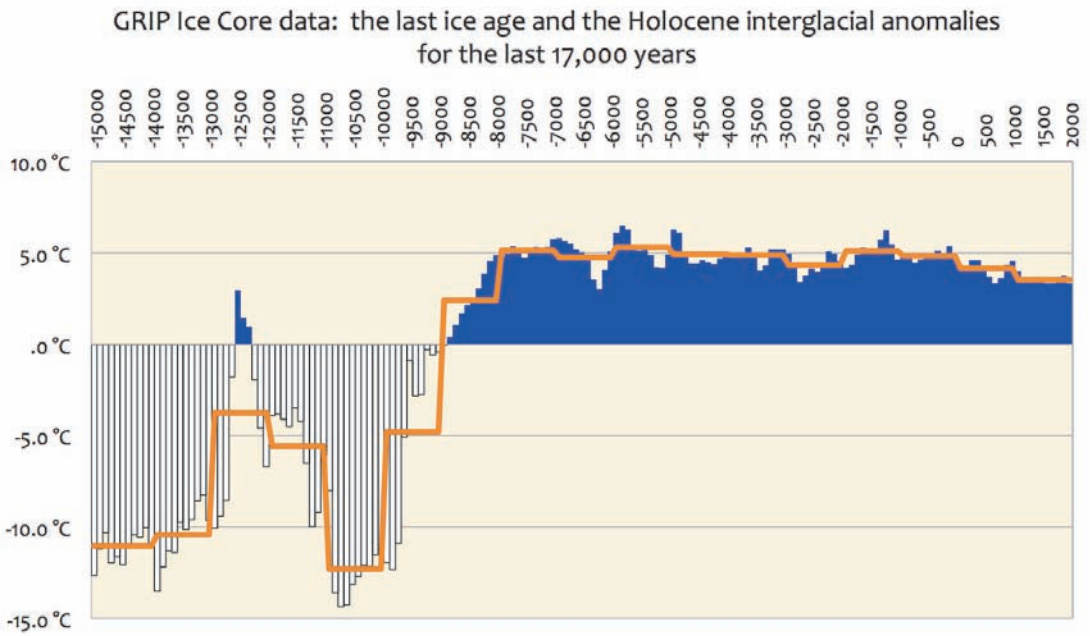
Over the past 10,000 years the current epoch has been progressively cooling since the early "climate optimum". Overall in the 10,000 years the world has cooled gradually by about 1.0 °C. There were other

well documented temperature high points during the period, including the Minoan, Roman and Medieval warm periods.

However the most recent period of 1000–2000 AD was the coolest millennium of the whole epoch: see John Kehr the Inconvenient Sceptic.[v]



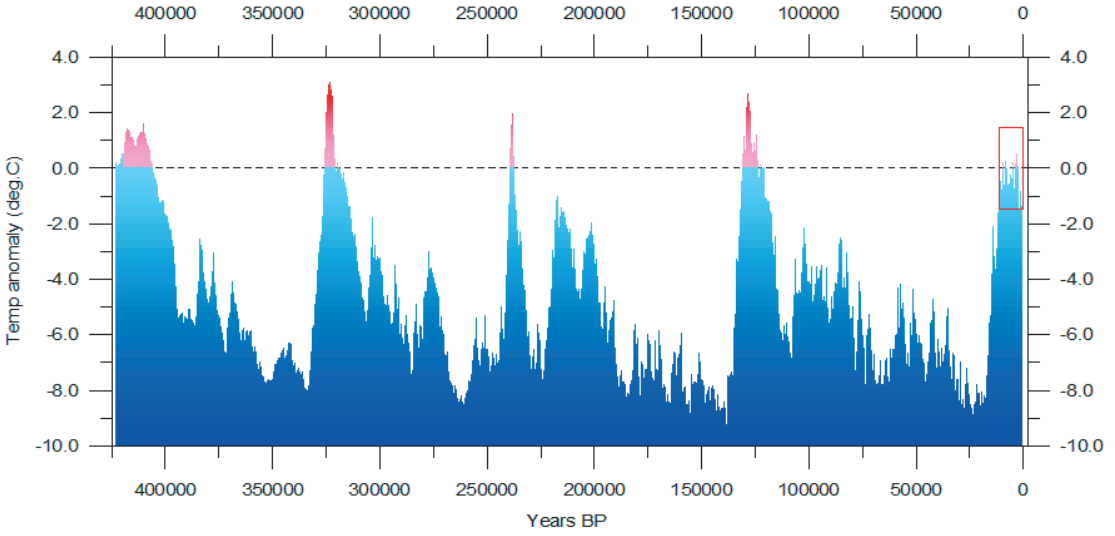
However a longer term record shows that only 13,000 years ago the world was in the depths of a real ice age with temperatures about 12°C lower than at present.



So interglacial periods of about 12,000 years have been occurring regularly about every 120,000 years. They are interspersed by real 100,000 year long ice ages, when vast ice sheets cover large parts of the world beyond the tropics.

The previous Eemian interglacial epoch was some 130,000 years ago. At its peak it was about 3°C warmer than our current Holocene interglacial: hippopotami thrived in the Rhine delta. The Eemian also lasted about 12,000 years.

The pattern repeats itself,[vi] there have been five interglacial events in the last 500,000 years.



At ~10,500 years our current cooler but benign interglacial is coming towards its end and the reversion of our planet to a real ice age is foreseeable.

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[ii] see: http://www.weatheraction.com/displayarticle.asp?a=525&c=5

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[iv] http://www.ncdc.noaa.gov/paleo/icecore/greenland/greenland.html

[v] see: http://theinconvenientskeptic.com/chapters-8–10/

[vi] http://www.climate4you.com http://geoweb.princeton.edu/people/bender/lab/downloads/Petit_et_al_1999_copy.pdf

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Written evidence submitted by Brian R L Catt (CLC038)

1. *Personal*: I am an independent professional electrical engineer, physicist and Manchester MBA, widely experienced in the scientific and commercial applications of physics and engineering in research and business. My scientific formation includes four years at NPL, seven at the NRPB at Harwell, two at Imperial College, in a range of practical and research science responsibilities before an MBA and over 30 years in high technology business.

2. *Introduction*: I believe your questions miss the core point, as they assume science is communicated honestly by government using the proper scientific disciplines that true scientists apply to independently tested hypothesis as the only proven science, science fact, and all the rest unproven scientific hypothesis, science fiction.

But government has now created a new industry to exploit science as a belief in some form of science fundamentalism for profit and control, exploiting the lack of absolute scientific principles in much "science" outside physics, relying on the inability of a technologically uninformed public and arts degree based media to independently review the assertions of "science" made to justify legislation,—easiest to do with easily believed but utterly deceitful assertions based on science fiction about what can actually deliver for UK plc, and supported by a political inquisition against anyone who tries to communicate the truth in public. Particularly independent scientists who are labeled "skeptics" as if pointing out the proven truth was bad. Might as well call them heretics.

Professors Colin Mc Innes, Gordon Hughes, David MacKay, the whole of thè Lawson Foundation, and many, many others. They only deal in the absolutes of proven science, and are not rewarded by the renewables industry as are their detractors. Yeo, Hendry, Deben, Huhne, etc, This is becoming a massive problem in a society that must depend on science fact to stay developed. A science theocracy cannot succeed.

In *summary* "Science" has been hi jacked by lobbyists for easy profit at public expense by law, almost wherever possible, the "eco" excuse being the most common. Nothing in "science" is as it seems. MMR was the latest example of what ignorant belief and science fiction from a non-scientist exploiting some unrelated

discipline for credibility can do (Medicine and other non-numeracy based disciplines are serial offenders in promoting science fiction). Science communication by government is little better when it wants to exploit science to promote a belief—and needs route and branch fixing before communicating any more "science". Science is not a relative belief bendable to political purposes as an instrument of policy, it is absolute science fact whose laws once established can be changed by no one without the application of similar rigour, a new hypotheses, which await proof before being acted upon.

Claims for "science" from government are often uttered by unknowing soft degree PR men in support of lobbyists who benefit from the laws passed in its name—Ed Milliband, Chris Huhne, Charles Hendry, Tim Yeo, Ed Davey, David Cameron have all been guilty of this, some for "policy" support, others for actual indirect financial reward.

In fact "the greatest challenge we face" per Cameron—of climate change invoked to support renewables legislation promoting 100 or 200% subsidised wind farms and bio fuel burning that overall make CO2 emissions expensively worse in science fact—is something that was always unproven and whose nature and causes remain unknown outside of orbital and precessional terrestrial variation and solar intensity variance, plus a dash of plate tectonics and its consequences. In science fact global warming hasn't happened as advertised for 15 years, and the major effect of the bogus legislation on the UK economy has been to waste growing billions of our money in pointless energy poverty on prescriptions that on the joined up science and even if it worked can't affect any of the consequences of the science fiction in practical fact taken globally—to profit generator lobbyists for nothing back. So a double fraud on science fact.

3. *Its not just me that sees this:* Government statements on science are frequently untrue on direct science fact and are increasingly treated as such by the quality media as a result. They have smelled the science fiction for profit by law rat at the heart of lobbyist led government.

The media now look deeper into whether political science statements are independently verified science or just a deceptive communications department statements as is so often the case, purporting to be from Ed Davey, David Cameron, etc. , , misusing statistics and proven science while avoiding rigorous peer review—eg continuing assertion of accelerating human caused climate change related to CO2 emissions and false claims that energy policy solutions can change this. The physics says they can't. (Except quietly rehabilitated nuclear, over the Lib Dems science denying bodies, because in science fact its all that can work for the UK after fossil.

4. *What "Scientists"?* Outside of this we have the dodgier anti-something "scientists" with no qualifications in the subject they pronounce on, and less respect for the pure disciplines of science fact, such as Sir Paul Nurse et al, a discredit to real science and the Royal Institution. Perhaps the worst offender is the utterly discredited "Doctor" Helen Caldicott's claims of a million dead from Chernobyl using disproven LNT hypothesis etc. (about 50–60 in fact), exposed by the once anti nuclear George Monbiot! But still her anachronistically named organisation "Physicians for Social Responsibility" gets air time as unchallenged radiation experts on the BBC. nb: The BBC is another problem as a promoter of science fiction on energy by policy..

"*Doctor Who?* Of course Caldicott is not even a scientist of any sort, like the MMR "Doctor", but a medic with craft skills and some very scientifically deniable beliefs. It seems the same problem occurs with climatologists whose "scientific" models owe more to untested mathematical assumptions presented as real science than real physics. Charlatans when they claim anything for them ex- ante.

5. Consequences: What we have as a result of these science fiction promoters for power and profit, such as the German Greens, is unproven hypotheses being presented as scientific fact by people outside rigorous scientific disciplines, claiming the same weight for their untested assertions. Such as your topic of climate change's relation to human created CO2 emissions and its use to justify energy policy and legislation. No temperature rise over 15 years per NASA and the Met Office. Just a simplistic and ultimately conceited model assuming now clearly disproven relationships to predict something way beyond the scientific capabilities of the less than capable "scientists" behind it.

These were not scientists presenting proven science in the terms of their discipline, just mathematician science fiction writers with too much self-belief guessing for fame. Gamblers. Not true scientists. Such academic egos are a gift to lobbyists and politicians who can exploit their beliefs for easy *MONEY.* In this case government created a massive "scientific" deception to divert some easy subsidy Bilions to lobbyists, using energy policy's "renewable" generating prescriptions. These make large and fast fiscal returns on capital by law but cannot deliver any of the claims of adequacy, controllability, sustainability or affordability made for them on the science in terms of a joined up developed UK economy (until nuclear got slipped into the renewable language). In science fact all this policy does is deliver easy Billions to generators to increase emissions overall from building utterly inadequate generation that is totally dependent on the reliable base load fossil power it is in scientific fact parasitic upon to exist, and obsolete without it.

6. *Science Fiction is Easy to Disprove*: I and any physicist who studies this for long can support the above hypothesis with proof in any educated forum. I explain the detail in the APPENDIX (E&OE as I am ill and out of time) for anyone who doubts the clear deceptions for regressive profit in energy policy, or the science facts of the science fiction claimed to support it. A "science" based fraud on both the false justification and its remedy.

7. *Ignorance of Science Culture Makes Presentation of Truth Harder than Science Fiction*: While real scientists and particularly physicists must follow the rules of science and present evidence and balance, medics and climatologists, and of course politicians, are able to get away with simple Priest like assertions of faith when telling people science fiction is science fact.

As a result mistaken hypotheses have become science for the hard of thought. For a scientist to deliberately represent an unproven hypothesis as a fact is lying. Exploiting science fiction for the financial benefit of political lobbyists by law at the people's expense is political fraud. What we now have.

I have set out the data and basic scientific principals in writing in the appendix with simple examples for you to validate my hypothesis independently by peer review. Not opinion. Scientific method.

8. *Why? It's all about the money*, science has been corrupted to support a legalised energy fraud by government, promoting bogus science as a justification for imposing laws delivering easy lobbyist profit for nothing back.

In this case using the Goebels approach of repeating the big climate change and capable renewables lies often enough, as hard to disprove as to prove, except if you are a scientist. Science fiction claims to have, but does not have, equal weight against science fact. One is supported by independent data, the other mere assertion. In this case the deception is exploited to enrich lobbyists at massive and fraudulent public cost by law, through regressive energy subsidies in the many Billions, incapable of delivering anything claimed for them in the law's justification. The only hockey stick effect is on the pointlessly wasteful energy poverty imposed by energy policies prescriptions.

9. *Interim Summary:* So I don't believe government is presenting science well, no, because it has deliberately mixed up science fact with science fiction to exploit science and public ignorance for easy profit and power by law. Legalised state fraud exploiting science fiction using the primitive approach of a theocracy.

The rigorous disciplines of hypothesis and independent test that should have been applied have been utterly ignored by politicians such as Ed Milliband, Chris Huhne, Ed Davey, Charles Hendry , Tim Yeo, Lord Deben and David Cameron, and many more—all apparently anxious to enact or sustain legislation justified on unproven science beliefs, and directly false on the science fact in respect of assertions regarding the adequacy, affordability, sustainability, decarbonisation, controllability, etc.. of its subsidised prescriptions.

10. *Science Fiction*: In science fact the prescriptive solutions of our science fiction energy policy can only make emissions worse, and their mostly weak variable energy sources can only deliver less adequate, much more expensive and utterly inadequate electrical energy supply, and finally are usefully unsustainable when fossil has gone—and are all supported by law that asserts the science fiction opposite. The alternative reality gets more bizarre when examining the best solutions in science fact.

11. *Science Fact*: In joined up science fact its simple to demonstrate CCGT gas and nuclear are our best, most capable and most rapidly decarbonising solutions to migrate to progressive, affordable, adequate, sustainable, zero carbon nuclear electrical energy, all there is that can actually power our developed economy when fossil has gone.

Whether you believe in global warming or not doesn't matter , the best solution is not the easy money for generator's policy prescriptions at two or three times the wholesale price by law.

Political science's "alternatives" and "renewables" are no more than the icons of a religious dogma used as a means of control, made up assertions presented as facts for profit, untrue in rational science fact when considered at the joined up macro level. It's a massive fiscal deception of the public using taxpayers money to promote bogus and/or unproven "science" for fraudulent lobbyist profit and the personal gain of their political representatives—such as Tim Yeo, Charles Hendry, Lord Deben, et al. Hardly the objective, honest, science based, rational democratic approach we need to stay competitive in a totally energy dependent developed technological economy.

12. *Why Better Science Communication Matters*: The misrepresentation of science for political and fiscal gain by law is how we now have an energy policy that in science fact cannot reduce CO2 overall, pointlessly costs us two or three times more wholesale for its prescriptive "alternative" and "renewable" energy sources that aren't either of these things in fact and make things worse overall at the macro level, both in turn justified on a climate model that has been disproved in the assumed relationship between the CO2 emissions and global temperature rise that was used to justify the fraud.

Real science was not honestly communicated here, or used to the public good. A hypothesis was distorted into science religion presented as fact, complete with an inquisition against truth tellers who understood its deceptions, to legislate for massive profits to generators at the pointless energy poverty of every citizen in science fact.

So YES, would be great if government had a program to begin telling the public the truth on climate change and energy policy, and differentiate clearly between the unsupported beliefs of science fiction exploited for profit at our expense, and the proven science of hypotheses independently supported by tested data.

13. *Climate Change Basics*: In short the science facts are that atmospheric CO2 has risen by roughly c.200ppm/2.5% to around 400ppm while global temperatures have stayed flat over the last 15 years per the MET office HADCRUT3, NASA , and other respected data, etc.

There is no mutually accelerative effect shown with CO2 and water vapour, possibly a contrary effect. The modelers just don't know. They guessed and were wrong. Science Fiction. The IPCC model was a hypothesis awaiting independent validation, not proven science, based on a late 90's climate change hypothesis dressed up as proven science. Its predictive model is now in need of a major rethink, its relationships disproven as asserted. Work in progress. No basis for the legislation.

Our energy policies and their easy profits associated with it also require review.

14.*What The Datas Say: Firstly* because *alternatives and renewables as legislated cannot actually reduce CO2 significantly* and cannot deliver most of their claimed benefits to justify their expense in costed science fact, *and second* because climate change is not as was guessed at by a predictive model that is in fact an incorrect hypothesis about the highly complex multivariate and incredibly difficult to predict global climate. Just wrong.

More Reasons to be Concerned by Science Fiction: Sea levels are not rising dramatically either. In fact the Gaya theory seems more supported than the very unproven "accelerating climate change from human activity" climate change hypothesis. Lovelock has recanted on climate change.

In spite of the developing nations ramping up their emissions far more than any reduction we can contribute with our 2% of total human created emissions, with or without our energy policy, the sky is not falling and the energy policy that was created to monetise climate change for generator lobbyists by prescribing modalities that cannot solve the problem used to justify them is exposed as just that—by the science fact we always had but was misrepresented by politicians whose only grasp of it was votes and easy money for them or their lobbies.

15. *Generation Basics—The Real Science Answer to Energy adequacy, affordability, sustainability and decarbonisation:*

It is easy to use basic science to show that CCGT gas short term at 50% greater thermal efficiency of coal and open cycle gas and half the CO2 of coal when replacing coal, plus zero carbon nuclear generation long term, offer the ONLY capable base load energy solution for a developed UK economy. The expensive prescription of alternatives and renewables simply can't. Subsidised prescriptions are woefully inadequate to power a developed economy because of their source energies' weakness and substantially uncontrollable variability, and are utterly fossil dependent in science fact to exist, actually parasitic on the better/cheaper fossil energy they depend on.

On self evident fact when fossil energy is economically ended nuclear base load will be all we have to meet a two–three times larger electrical demand* (*DECC).

The weak uncontrollable alternative generation will be pointless as a grid supply without the dependable base load fossil generation it depends on to exist at all, and to make its subsidies by pushing fossil generation's reliable energy off the grid at two–three times the price. These are simple, self evident and established scientific truths, mis-represented by the government to the public for private profit at public expense using misleading science fiction, like the wind is free. Only the wind is free, the energy costs you your future.

16. *Summary:* Government has used a raft of thoroughly misleading ideological assertions and unproven hypotheses not supported by proven science to justify its energy policy to date. These have been engineered in Whitehall to promote and then monetise an unproven crisis by law at the public's avoidable cost exploiting science fiction, by preferring what can only make CO2 emissions worse on the established science with massive subsidy at huge avoidable public cost, by legislation that prefers what cannot deliver the policy objectives over that which can, for faster and easier profit by law.

Increasingly the truth of this deception is being presented by the National Media who now smell the rats in government science fiction. So for any future credibility the truth on climate change needs to separate science fact from science fiction.

- — What is actually established science versus unproven hypothesis and political beliefs dressed up as science.
- — How likely complex models are to predict the future when multivariate relationships are not understood; and
- — How none of fhe expensive prescriptions of energy policy can either decarbonise our economy or meet any of the long term objectives originally claimed for them by overtly fraudulent law on the science fact.

Or increasingly no one will believe you.

So a whole new, honest and proven science based approach which only promotes established science needs to be adopted to tell people the PROVEN SCIENCE FACT that underlies legislation related to climate change and energy policy. This won't be easy to start with, as we were sold a basket of deceit by some large political

egos to justify the legislation that is adding accelerating and avoidably wasted £billions to our national debt in science and economic fact.

I have set out some details that further support these statements as submitted in evidence to the ECC Select Committee, if you are deeply involved enough to check the science fact and doubt the above is based 100% in established physics and technical fact simply read this, and check what it says independently.

April 2013

Written evidence submitted by The Royal Academy of Engineering (CLC039)

1. The Royal Academy of Engineering is pleased to respond to the Science and Technology Committee's inquiry into the public understanding and policy implications of climate change policy. This response has been prepared following consultation with a number of our Fellows with expertise in this area, both in industry and academia.

2. The Academy's expertise in this field is primarily in the implications of climate change policy for the UK's energy system, from energy generation to the systems that use it, and also the challenges of adapting the UK's infrastructure and built environment to the impacts of a changing climate. The scale of these implications, as driven by policies such as the Climate Change Act 2008, will require a radical change in the energy system that will not be achieved without the engagement of the public. The Academy's 2010 report, *Generating the Future*,[58] gives some idea of just how massive these changes will be: such change requires support and acceptance by society.

3. Without a broad awareness of the severity of the problem of climate change, it may be very hard to generate public support for the necessary measures to mitigate and adapt. Climate, energy and the economy are intricately linked, with each having a direct bearing on people's sense of wellbeing and prosperity. Forcing rapid and significant changes on the energy system will inevitably result in a negative reaction from those who are expected to bear the cost and whose lives will be affected by the resulting major infrastructure projects. This is particularly the case when the current system has functioned well and appeared to be relatively stable for over a generation. However, perceptions will have been affected by a number of issues and global events including the long-running economic downturn, the emergence of shale gas in the US, the Fukushima incident in Japan and a failure to agree a successor to the Kyoto Protocol. The situation is unlikely to be any less dynamic in the future.

4. The climate is an incredibly complex, dynamic system and conveying information about it, and how human beings are affecting it, is extremely difficult. The chaotic nature of the climate will mean that fundamental uncertainties will always remain despite our increased understanding of the system. In fact, recent insights into feedback mechanisms may even have increased levels of uncertainty.[59] Even the most basic of terminology can create problems. The term "climate change" can lead to confusion because what is generally meant by this term is anthropogenic (ie caused by human beings) climate change but the abbreviated term can appear to ignore the fact that the climate has always been changing. It also fails to convey anything about how fast or extreme the changes will be. Similarly, the term "global warming", which refers to the long-term trend in average global surface temperatures, can be misinterpreted as an expected steady year-on-year increase in temperatures, which is not what has been seen.

5. However, the real effects of climate change are extreme variations in weather, and these are in fact more likely to be noticed by the public rather than long-term temperature trends. Recent years have provided clear indications of this which are in the public consciousness. One example of severe weather risk is the impact of tropical storms on the eastern US seaboard. Storms such as Katrina and Sandy caused almost 2,000 deaths and costs of over $100 billion.[60] Attributing these extremes in weather to anthropogenic climate change can be difficult, but several studies have increasingly found evidence that this is the case. See, for example: Hansen et al, *PNAS* 2012,[61] Pall et al, *Nature* 2011,[62] and Otto et al, *Geophysical Research Letters* 2012.[63] Framing the climate change issue in terms of these kinds of identifiable (and recently experienced) risks may help raise awareness and appreciation of the problem. However, care must be taken as not all extreme weather events can be attributed to anthropogenic climate change. The 2012 US drought appears to be one such non-anthropogenic event.[64]

6. Terms relating to the technology needed to limit the effects of climate change such as "renewable", "low-carbon", "clean" and "sustainable" can also lead to confusion. However, the prudence of using less energy (and therefore saving money) and using renewable resources rather than finite supplies of fossil fuels that are subject to global supply pressures and volatile prices, may in itself be a good argument for using lower carbon

[58] www.raeng.org.uk/news/publications/list/reports/Generating_the_future_report.pdf
[59] www.nature.com/climate/2010/1002/full/climate.2010.06.html
[60] www.bloomberg.com/news/2012–11–05/sandy-s-power-dwarfed-by-katrina-s-gutting-of-the-gulf.html
[61] www.pnas.org/content/early/2012/07/30/1205276109.full.pdf
[62] www.nature.com/nature/journal/v470/n7334/full/nature09762.html
[63] www.agu.org/pubs/crossref/pip/2011GL050422.shtml
[64] www.drought.gov/media/pgfiles/DTF%20Interpretation%20of%202012%20Drought%20FINAL%202%20pager_V4.0.pdf

energy. Such an approach may be more likely to succeed since it describes benefits that will accrue to the individuals rather than society at large.

7. A number of organisations and individuals have attempted to tackle the difficult task of explaining climate science. The work of the IPCC is generally seen as being the best assessment of the current understanding of the science. In the UK, the Committee on Climate Change and academic organisations such as the Met Office Hadley Centre and the Grantham Institute for Climate Change are respected sources of information. These, however, tend to produce quite technical reports that may not be widely read other than by experts or interested parties. The Royal Society has produced a more accessible summary of the science of climate change[65] and successive Government Chief Scientific Advisors have kept climate change high on the list of priorities both in government and the media. Departmental Chief Scientific Advisers should be encouraged clearly and publicly to articulate the evidence, in support of the GCSA. Professor David MacKay's publication, *Sustainable energy without the hot air*, is a good example of how to do so in the area of energy policy. Such voices have to compete, however, with the many other voices in the media that, in some cases and for various reasons, emphasise the extremes of the argument.

8. There is an obvious tension in seeking to persuade the public that large sums of money need to be spent now to address a problem that is full of uncertainty and long-term in nature. The problem needs to be recast in terms of risk management encompassing all aspects of mitigation and adaptation. This would include additional uncertainties relating to primary fuel supplies, available generating capacity and imports of energy. All these issues combine to make the development of a functioning UK energy system an enormously complicated problem. Technologies do exist and can be developed that, with sufficient engineering skills and ingenuity, can address the challenges. But there is no "magic bullet" and a certain amount of disruption and cost is inevitable. What is vital, but challenging, is a consistent message from all parties that does not shy away from these difficulties and uncertainties. Government, industry, academia and learned bodies all have a role to play in providing the public with a coherent message. Consistency across government departments and policies is particularly important.

9. The "public" includes people from many different groups and all walks of life, whose daily work and business will need to change in the effort to limit carbon emissions. Engineering will be at the heart of the efforts to do this, and it will affect and make demands on stakeholders throughout the engineering supply chain and including clients and customers. For example, the recent Green Construction Board Routemap indicates that reducing carbon emissions in the built environment by 80% will require the whole construction industry to do everything that is economic and sensible, particularly in retrofitting existing building to improve their efficiency. This is going to require an immense rethink in construction, affecting businesses from large consultancies to self-employed builders.

10. Government does need a greater understanding of the techniques of engaging openly with the public and of what drivers can affect society on a large scale. Currently, a number of departments have their own external behavioural advisors, but they do not share a consistent approach.

11. Another challenge is raising public awareness of international strategies needed to address what is a global problem. The UK's direct greenhouse gas emissions constitute around just 3% of the global contribution. One can understand why the public, and indeed government, might weigh this relatively small contribution against economically disadvantaging the UK in the global economy. However, the Climate Change Act's 80% emissions reduction target is based on an equal share per person of an assumed global emissions ambition by 2050. A positive message to promote is that the UK can play a significant role in providing technologies and thought-leadership to address the global issue and, to be taken seriously in this, must set a good example with its own greenhouse gas emissions. It is clear that the changes required cannot happen without widespread acceptance of impacts on lifestyle and behaviours.

12. The nature of public dialogue on climate change must move beyond arguments over the science, to engage the public in debate on the political, technological and lifestyle changes that are needed to deal with its effects. In this sense, a number of issues arise. What are the possible options available to reach this target and what are the pros and cons of each? What should the UK's role and ambitions be in relation to other nations and the rate at which we decarbonise? How does climate change relate to other environmental issues such as resource depletion, population growth and pollution? Will energy prices inevitably increase, and how can this be reconciled with groups such as those in fuel poverty and energy intensive industries?

13. Many of these issues will require difficult and complex solutions, but the public may generally be better informed of and receptive to the difficulties than they are given credit for and better levels of education in science and technology can only serve to improve this level of understanding. Framing the dialogue in specific terms—for example, that better energy efficiency and less waste has clear advantages, especially in times of austerity—could enable more people to come on board with the debate.

April 2013

[65] royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2010/4294972962.pdf

Written evidence submitted by Rupert C E Wyndham (CLC040)

1. Introduction

The Foresight programme findings, which instigated the Committee's solicitation of views from the public, are substantially out of date.

2. Declaration of Interests

In conspicuous contrast to numbers of MPs, I have no financial or reputational interests whatsoever in the subject of alleged man-made climate change. Neither have I ever had.

3. Public Perception of Climate Change

The public, rightly, increasingly perceives alleged anthropogenic global warming as a scam designed to:

- extract stealth taxes;
- reward rich third parties often, or even usually, family, personal friends or political allies of legislators;
- increase state centralisation, most particularly by seeking to establish a mythology of putative consensus flowing from unquestioning reference to "authority" (argumentum ad verecundiam);
- manipulate unemployment statistics by the creation of superfluous and worthless bureaucracies.

The perception of climate change as no more than a political contrivance has grown markedly during, say, the last two years. Evidence is easily found not just from numerous polls or from anecdotal indications, numerous though these are, but from the fact that sceptical news stories, once as rare as altruistic politicians, are now common currency in both tabloid as well as broadsheet national newspapers.

Why?

3.1 *Science—overview.* AGW "science" has been fraudulent from inception. Since it always lacked authentic scientific underpinning, it was obliged to have recourse to chicanery—contrived claims of a scientific consensus, refusal to observe protocols of scientific method (verification and replication), subversion of peer review, avoidance of debate, denial of contra-indications, concoction of data, misrepresentation, misinformation, disinformation. But, once politicians had bought into the profiteering racket, it then became imperative to divert vast state funded financial resources into promoting it. For a while, this worked. But, as others have recognised in their times, "the big lie" may be made to gain traction, but will not long withstand exposure to dispassionate analysis. This made it imperative to censor all potential exposure thereto; hence the role now of the BBC and a complicit academia, which could be bought ("grant troughing", in the vernacular).

3.2 Is there any aspect in which AGW "science" is plausible? No, quite simply impossible. The orthodoxy posits that fundamental and potentially dangerous alterations to the Earth's climate may be wrought by minute changes in the atmospheric concentration of a single component, a trace gas amounting in total to less than 1/25th part of a single percentage point. By any standard, this constitutes an hypothesis that can only be regarded as facile and unlikely, if not positively flaky, the more so when taking into account that:

- CO_2 is the sine qua non of all life on Earth;
- the geological record discloses numerous precedents for CO_2 atmospheric concentrations many times greater than those prevailing today, during which there was no "runaway greenhouse effect"—another delusional concept. In fact, the interfaces between the Ordovician & Silurian epochs (4000ppmv) and the Jurassic & Cretaceous (2000ppmv) were periods of planetary glaciation, totally destroying the linkage between CO_2 concentration and global mean temperature. CO_2 atmospheric concentration currently stands at around 390ppmv.

An implausible hypothesis requires exceptionally strong proof.

Has there been any evidence to support of the AGW hypothesis? Not one example has yet been put forward drawn from observation in the real world.

Nevertheless, this still does not represent the flaw au fond in the AGW edifice. That, ironically, is provided by the Intergovernmental Panel on Climate Change (IPCC) itself, of which more in due course. Pro tempore, it is sufficient to note that, writing for once truthfully and accurately, in its First Assessment Report (AR1), it made the entirely correct (though obvious!) declaration that the atmosphere/climate is a vast, chaotic, non-linear system, not susceptible to prediction. In consequence, the IPCC added that it would/could deal only with "scenarios". By the advent of AR2, however, it was clear that it had every intention of promoting not only prediction but catastrophism also. And the supposed scientific justification for such predictions? Why, to be sure, they were to be attributed to minute alterations in a single variable, namely CO_2. For members of this Committee and others:

N.B. By virtue of underlying realities, the acknowledgement on the one hand that prediction is impossible and on the other an appeal to predictive determinism represents the juxtaposition of mutuallyexclusive propositions!

4. Credibility of Cited Authorities

4.1 *IPCC*

Cataclysmic climate change propagandists frequently seek to dismiss questioning of their orthodoxy by reference to the alleged absence of specialist expertise possessed by dissenters. In spite of this, the public is not so dense that it cannot see the clash between this proposition and the appointment of a railway engineer to head up what is, supposedly, the world's primary authority on proclaimed climate change. Moreover, as propaganda from the IPCC and pseudo-environmentalists has grown increasingly shrill, so too have investigations multiplied both of their claims and of their basic integrity. It did not take long for a string of outright falsehoods to be exposed:

- shrinking Himalayan glaciers;
- 100% peer reviewed research materials (more than 30% found to be the work of eco-extremists and even students);
- rising sea levels; and
- rising global temperatures;

to name but a few. Neither did it escape public attention that Rajendra Pachauri had substantial conflicts of interest between his official role and his business activities, nor that these were both insolent and brazen -

("They're of interest to me so are not conflicting.").

4.2 *Government agencies: Met Office, University of East Anglia, Hadley Centre, Tyndall Centre for Climate Change Research, Grantham Institute*

To a greater or lesser degree of perceptibility, the reputation of each one of these taxpayer funded bodies fatally undermined by the "Climategate" scandal although, as an objective reality, "Climategate" served only to confirm what was already self-evident. Subsequent whitewashes instigated by Parliament in no way mitigated the damage caused to their reputation. Instead, they merely served to aggravate public perceptions of venality within the composition of parliamentarians, perceptions already deeply and irrevocably entrenched from other revelations. Moreover, since this submission addresses public perceptions, this section should not be closed without noting what has been a risible performance by the Met Office. Neither should and mendacious manipulations by the Tyndall Centre, amongst others, be overlooked. There has been frequent public comment on the seemingly inexplicable morphing of the original use of the term "global warming" to "climate change". Any exploration of the blogosphere will readily yield sardonic comments on this transformation, even though many seem not to have knowledge of its source.

That source is, in fact, within the public domain. It is vested, courtesy of the Tyndall Centre, in "*Working Paper No. 58"—The Social Simulation of the Public Perception of Weather Events and their Effect upon the Development of Belief in Anthropogenic Climate Change*—Dennis Bray & Simon Shackley, Sept. 2004) [My underlining]

"Only the perception of positive anomalies will be registered as an indication of change, if the issue is framed as global warming.

Both positive and negative temperature anomalies will be registered in experience as an indication of change, if the issue is framed as "climate change".

We propose that in those countries where climate change has become the predominant popular term for the phenomenon, unseasonably cold temperatures, for example, are also interpreted to reflect climate change/ global warming."

In plain English, too hot and it's CO_2. Too cold and it's CO_2. No change and it's CO_2. What is clear is that Messrs. Bray and Shackley knew well that they were selling a pup; the ethics of the second hand car dealership or, perhaps more immediately, the solar panel salesman, are normative throughout the climate change industry.

Hypotheses that, at least in principle, are not capable of being disproved are not science; they are merely manifestations of cultist dogmatism and demagoguery.

4.3 *The European Union*

In spite of increasingly desperate prime ministerial and other efforts to sustain a rearguard action, the EU is now seen by a majority in this country (as well as more widely throughout Europe) as not just *un-* but, beyond redemption, pro-actively *anti-*democratic, uncontrollably profligate, centrist, malign, bureaucratic, interfering and institutionally corrupt. Enthusiastically adopted also by a British classe politique, its role in promoting grotesquely polluting, expensive and impractical palliatives to a non-problem is widely resented. Well grounded hostility towards Brussels translates readily into aversion to any cause or policy espoused via EU dictat emerging from an anonymous and unaccountable bureaucracy.

4.4 *BBC*

The BBC is systemically biassed, by no means exclusively but most particularly, in relation to its coverage of so-called climate science. Its flagrant partiality is now the common currency of newspaper comment, as is its total absence of scruple in pursuit of a leftist agenda.

On the specific subject of "climate change", the so called "28gate" revelations have now laid bare its mendacity, as has the rejection by BBC management of the findings of its own enquiry established to report into bias within climate change coverage. Neither was the damage lessened by subsequent attempts to invoke the assistance of a bought scientist. His basic recommendation that the BBC should give even less coverage to questioning voices merely made him and his paymasters appear disreputable. After all, even less of nothing remains nothing. Disrepute was only aggravated by an inept attempt to justify this on the grounds that any such open dialogue would inevitably involve only genuine scientists on the one side pitted against ignorant but vociferous laity on the other. As many were able to point out, heavy weight scientists, including formidable names specialising in the field, were easy to identify in substantial numbers. If nothing else, to the man in the street, this made it clear beyond dispute that anthropogenic global warming, far from being a settled consensus, was in reality a maelstrom of conflicting opinion within the scientific, not just the sceptical lay, communities.

The BBC is now routinely in breach of its own Editorial Guidelines, supposedly a legal binding framework. Breaches of impartiality are a daily occurrence. Accuracy is subordinated to the party line. It becomes ever more difficult to identify journalistic reports from which the prejudicial opinion of the reporter is excluded. And, needless to say, the supposed right of reply is impudently ignored. In a nutshell, the BBC is corrupt. It is seen to be, and is not trusted. That an icon such as David Attenborough should be seen to be "sexing up" reports adds to public disillusionment and cynicism.

4.5 *The Royal Society*

Under the stewardships of its last three Presidents, from being a national treasure, the Royal Society has become a propagandist for the human induced climate change paradigm. It is fair to state that over the course of the past decade, the RS has exercised all its authority and prestige in advancing the orthodoxy by lending to it a spurious veneer of scientific/intellectual respectability. It has gone to inordinate lengths to encourage acceptance of the proclaimed consensus and to discourage all debate. With respect to the latter, I am able to speak from experience. More to the point, even significant numbers of its own Fellows have expressed disquiet at the public stance of the Society. This too is in the public domain, and the public at large is increasingly aware that the alleged consensus is not even remotely as monolithic as is claimed by pseudo-environmental jihadists.

4.6 *Academia*

Mutatis mutandis, much of the foregoing relating to the RS may be transposed to academia at large, especially scientific academia.

4.7 *The print media*

Except amongst AGW cult fundamentalists, the reputations of The Guardian and The Independent have been increasingly under attack for their unshakeable left wing cultist prejudice. The Daily Telegraph has gained credibility, because it has consistently over a long period entertained both sides of the debate. A sea change, however, has occurred within the daily tabloids. Two years ago sceptical articles were rare to the point of extinction. They can now be described almost as the default position for both copy and editorial comment.

4.8 *DECC, DEFRA, Government Chief Scientist*

Widely seen to be tainted sources of information. Distrusted to the point of derision.

4.9 *Global Warming Policy Foundation (GWPF)*

The effectiveness of this foundation needs little comment. Even by AGW proselytisers its impact has been openly acknowledged. Arguably, success in its aims has been proportionate to its avoidance of theological certitude. Whether or not this is so, what is very clear is that its detractors are at a loss as to how to counter its influence. As a result, and in keeping with industry custom and practice, their fallback position has been ad hominem innuendo, primarily related to its source of funding. That such should be repeated by its current President demonstrates more clearly than anything else the loss of dignity suffered by The Royal Society as well as the depths of corruption it has plumbed under his stewardship and those of his two predecessors.

4.10 *Personal experience*

The cognitive dissonance between what they are being told and what they experience for themselves is not lost on the public. Their senses tell them that state pronouncements on supposed climate change are no better than outright falsehoods, the consequences of which are substantially impoverishing them. Moreover, huge numbers of citizens of a certain age have clear recollection of precedents without number for allegedly unusual and anarchic weather events. The Committee may wish to bear in mind that most can also read! The public is being hit in the pocket for no good reason. It is this—not the science, not the vapourings of parliamentary committees, nor even the evidence of their own senses—that will discredit the whole climate change farrago.

4.11 *The blogosphere*

Since officially sponsored information cannot be trusted, the internet is now the predominant source of dispassionate and reliable information on putative climate change. Numerous highly regarded blogs exist, which cover all aspects of the subject by recourse to data not unsubstantiated assertion, with many being run by, or closely associated with, scientists of immense prestige, who are dismissive of the orthodoxy.

5. Summary

This *submission* can be distilled as follows:

- The anthropogenic global warming hypothesis is a fraudulent chimera.
- Its adoption by Parliament has resulted in baleful and cripplingly expensive consequences for the country.
- Amongst these have been:
  - corruption of politics, both at national and local level;
  - corruption of national institutions—the Royal Society and the BBC, most conspicuously;
  - subversion of the integrity of the scientific enterprise and the education of the young;
  - despoliation of the natural environment;
  - immense pollution and habitat expropriation, albeit not necessarily on these shores;
  - diversion of financial resources on a blanching scale into worthless palliatives to non-existent problems; and
  - impoverishment of populations, both at home and abroad, to no good end, which has been the subject of repeated critical comment, as has been, in parallel, the self-enrichment of key players.

6. Terms of Reference

It is clear that the key driver for the Committee's solicitation of submissions from the public lies less in any desire to seek truth, but rather in the hope that ways will be opened for the manipulation of public opinion. As to the terms of reference, comment is made as follows:

- State of public understanding and recent changes—see supra.
- Trusted sources of information—see supra.
- Ways to improve public understanding/acceptance—none that could conceivably emerge from prevailing government sources. The print media do have a positive role to play in highlighting the corruption of the an anti-scientific consensus. It is a role that, finally, they are starting to fulfil.
- Importance of public understanding—plainly great. Otherwise the Committee would not be calling for submissions.
- Effect of public attitudes to climate science on engagement with energy policies—plainly *a*, if not *the*, primary concern of the Committee as well as others with vested interests.
- Behavioural sciences—psycho-babble is no answer. As in other walks of life, honesty of purpose is more eloquent.
- Learning from other countries—well, none from within the European Union or through UN bureaucratic channels. Asia would offer more fruitful prospects.

7. Postscript

Anthropogenic Global Warming, speciously morphed to "Climate Change", is not a scientific issue at all. The science is clear. There is no demonstrable causal linkage between carbon dioxide concentration in the atmosphere and global mean temperature. Neither is there any evidence that modest rises in global mean temperature would be anything other than beneficial.

Rather, because it represents a full frontal assault on the very notion of open and objective debate and evidence led scientific investigation, it constitutes a fundamental ethical issue of unique significance.

April 2013

Joint written evidence submitted by Bob Ward and Naomi Hicks (CLC041)

The Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science, is a research centre, chaired by Nicholas Stern, which brings together international expertise on economics, finance, geography, international development and political economy. Bob Ward is the Policy and Communications Director. Naomi Hicks is the Institute's Public Communications Manager. The Institute is funded by the Grantham Foundation for the Protection of the Environment and the Global Green Growth Institute. The work of the Institute is integrated with the activities of the Centre for Climate Change Economics and Policy, which is hosted by the London School of Economics and Political Science and the University of Leeds, and funded by the UK Economic and Social Research Council and Munich Re.

1. This submission begins with a summary of the importance of public understanding of climate change, before considering some of the latest research on the state of public understanding of the science of climate change, and subsequently drawing attention to the impact of climate change "sceptics", the media and climate researchers.

The Importance of the Public Understanding of Climate Change

2. There is overwhelming scientific evidence that emissions of greenhouse gases from human activities, particularly the burning of fossil fuels, is causing the Earth to warm and that unmitigated climate change poses huge risks for human societies in the UK and across the world.

3. The UK is already experiencing the direct impacts of climate change, with the average annual temperature recorded by the Met Office having increased by about 1°C since 1970, and provisional figures show an increase in heavy rainfall over the past few decades. The UK is implementing a range of measures to adapt to those impacts that cannot now be avoided, and to mitigate future climate change by, for instance, reducing its annual emissions of greenhouse gases.

4. It is crucially important that the UK public understands the direct and indirect risks that unmitigated climate change poses, and the options that exist for managing these risks, in order that they can make informed choices and participate in decision-making processes. However, it is important to recognise that public understanding of the science of climate change does not automatically result in public support for particular policies and measures to manage the risks.

The State of UK Public Understanding of Climate Change

5. The assessment of the UK public understanding of climate change is hampered by the lack of consistent long-term monitoring. The UK Government Departments have surveyed public attitudes on an ad hoc and inconsistent basis, which makes it very difficult to evaluate long-term trends. A very useful survey of the public understanding of climate change was carried out in seven waves by the UK Government's former Central Office of Information (COI) for the Department for Environment, Food and Rural Affairs (DEFRA) between March 2005 and March 2008. This comprehensive survey consisted of almost 30 questions about the causes and consequences of climate change, and policy options, but was discontinued after the creation of the Department of Energy and Climate Change (DECC) in October 2008. We have focused here mainly on those more recent tracking surveys that have monitored responses to consistent questions over a number of years.

6. The IPCC (2007a) set out mainstream science's fundamental conclusions about the causes and consequences of climate change with the following statements, against which the public understanding of climate change can be compared:

- warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level;
- most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations; and
- continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century.

7. The Department for Transport (DfT) published a series of annual surveys of UK public attitudes to climate change and transport which was carried out between August 2006 and August 2011 (for example, see DfT, 2012). It showed that the proportion of the public who were at least fairly convinced that climate change is happening fell slightly from 87% in August 2006 to 83% in August 2009, before dropping to 74% in August 2010. This larger decrease between 2009 and 2010 may have been due, at least in part, to publicity about controversies over e-mails that were hacked from the Climatic Research Unit at the University of East Anglia (UEA) and disseminated in November 2009, and the admission in January 2010 by the IPCC that a volume of its Fourth Assessment Report (IPCC, 2007b) contained a small but significant mistake about the speed with which the Himalayan glaciers would disappear at current rates of melting (IPCC, 2010). This survey for the DfT recorded a decrease in the proportion of the public who believed that particular sources of greenhouse gas emissions, such as road transport, contribute to climate change, It also showed a decline in the percentage who reported being at least fairly concerned about climate change, from 81% in August 2006 to 65% in August 2011. The survey was discontinued by the Department for Transport after August 2011.

8. The DECC commenced a public attitudes tracker in March 2012, but it only includes two questions about climate change (for example, see DECC, 2013). It found in March 2012 that 65% of the UK public were at least fairly concerned about climate change, and 38% think that climate change is caused mainly or entirely by human activities, with a further 42% indicating that natural processes and human activities are both partly responsible.

9. A survey carried out between January and March 2010, and reported by Poortinga *et al.* (2011), found that only 57% of the public in Great Britain tend to agree or strongly agree that most scientists have concluded that humans are causing climate change, even though no major scientific organisation in the world disagrees

with the IPCC attribution of global warming to greenhouse gas emissions from human activities. However, the authors concluded that "climate scepticism is currently not widespread in Britain".

10. A YouGov survey of the public in Great Britain in February 2013 found that 28% trusted senior academics working in the field of climate science a great deal, generally speaking, to tell the truth about climate change, with a further 41% trusting this group a fair amount. However, less positive results were obtained when a question about trust was asked in a different way. Shuckburgh *et al.* (2012) reported the results of a survey of the UK public carried out in March 2011 which found that only 38% tended to agree or strongly agreed that "climate scientists can be trusted to tell us the truth about climate change", with 25% reporting that they neither agreed nor disagreed.

11. Overall, the public opinion surveys show the following trends:

- a large majority of the public agree to some extent that climate change is happening, although this percentage has declined by a small amount since 2009–10;
- a large majority of the public agree to some extent that human activities are contributing to global warming, although this percentage has declined by a small amount since 2009–10;
- a small majority of the public agree to some extent that most scientists have concluded that global warming is caused mainly by human activities;
- a majority of the public is concerned about climate change, but this has decreased, particularly since 2008; and
- there is mixed evidence about the extent to which the public trust climate scientists to tell the truth about global warming.

12. The decline in public acceptance of the basic science of climate change, and the decrease in trust in climate scientists, is very probably due mainly to the publicity about the controversies over climate science in 2009–10. The decline in public concern about climate change is very likely due to an increase in worries about the economy since the start of the financial crisis and global downturn in 2008.

The Impact of Climate Change "Sceptics" on Public Understanding

13. The significance of the UEA hacked e-mails and the mistake in the IPCC (2007b) report was misrepresented by climate change "sceptics" (ie those who reject the conclusions of mainstream climate science). For instance, the Global Warming Policy Foundation, which was officially launched by Lord Lawson of Blaby just three days after the e-mails were published on "sceptic" websites, falsely alleged in an article in "The Times" that the e-mails showed that "scientists have been manipulating the raw temperature figures to show a relentlessly rising global warming trend" (Lawson, 2009).

14. The representatives of the Global Warming Policy Foundation continue to disseminate inaccurate and misleading information to the public through its website (eg see Ward, 2011a), speeches (Ward, 2011b) and comments to the national media (Ward, 2011c). It is somewhat surprising that the Foundation, which is a registered charity with fewer than 120 members (Ward, 2013a), has not been held to account by the Charity Commission for persistently misleading the public, given that the "Guidance on Campaigning and Political Activity by Charities" (Charity Commission, 2008), states: "A charity can campaign using emotive or controversial material, where this is lawful and justifiable in the context of the campaign. Such material must be factually accurate and have a legitimate evidence base."

15. In addition, the Foundation, whose primary activity is campaigning against UK and European Union policies to mitigate climate change, has attacked climate scientists for a lack of transparency, yet refuses to reveal the sources of more than £1 million in donations which it has received (Ward, 2013a).

16. The primary way in which climate change "sceptics" damage the public interest is through the spread of inaccurate and misleading material via websites to sympathetic journalists in the mainstream media, creating an "echo chamber of climate change denial" (Ward, 2012a).

The Impact of the Media on Public Understanding

17. There is evidence that the broadcast by Channel 4 in March 2007 of "The Great Global Warming Swindle" damaged public understanding of the science of climate change (Downing & Ballantyne, 2007). Following complaints about the programme, Ofcom carried out a year-long inquiry, but failed to investigate whether the programme was inaccurate or misleading on the grounds that the Broadcasting Code does not require documentaries to be factually accurate. In its ruling, Ofcom (2008) stated: "In dealing with these complaints therefore Ofcom had to ascertain—not whether the programme was accurate—but whether it materially misled the audience with the result that harm and/or offence was likely to be caused".

18. Although much of the BBC's coverage of climate change is high quality, there are some systematic failures to prevent its audiences from receiving inaccurate and misleading information. This is despite a review for the BBC Trust of the impartiality of the BBC's science coverage, published in 2011, which warned that climate change "sceptics" were sometimes being given disproportionate coverage and were not being challenged when they made inaccurate and misleading statements. In particular, inaccurate and misleading information is broadcast through presenter-led BBC radio and television programmes which seek to feature a

"balanced" debate between climate change "sceptics" and mainstream climate researchers. A particularly persistent purveyor of inaccurate and misleading information about climate change is "The Daily Politics" (Ward, 2011d, 2012b). A follow-up to the BBC Trust review in November 2012 failed to acknowledge that some programmes are continuing to broadcast inaccurate and misleading information about climate change.

19. However, much greater damage to the public interest is resulting from inaccurate and misleading coverage by the UK's national newspapers in print and online. In particular, some newspapers are able to exploit the systemic weakness of the self-regulatory system in general, and the Press Complaints Commission (PCC) in particular, which means that inaccurate and misleading statements can be published as long as they are labelled as "points of view". For instance, the PCC failed to uphold a complaint about an inaccurate and misleading article by Christopher Booker, published in "The Sunday Telegraph" in March 2009, in which he promoted the views of a climate change "sceptic" under the headline "Rise of sea levels is" the greatest lie ever told", on the grounds that "its responsibility was for publishing his views accurately rather than for the accuracy of his views" (PCC, 2009). By failing to hold newspapers to account for breaches of the Editors' Code of Practice, which specifies that "the Press must take care not to publish inaccurate, misleading or distorted information, including pictures", the PCC has enabled other publications to mislead the public about the science of climate change (Ward, 2011e).

20. Painter (2011) found that the promotion of the views of climate change "sceptics" in UK national newspapers increased sharply between 2007 and 2009–10, particularly in opinion articles in the right-wing Press. Mark Henderson, the former science editor of "The Times", has attributed the increase in the promotion of "sceptics" by some newspapers to the impact of the controversies over the so-called "Climategate" UEA e-mails: "What climategate certainly changed though, was the media narrative. At the very moment when world leaders were discussing how to respond to climate change, the focus shifted to whether it was happening, and whether scientists could be trusted. Conservative newspapers that had softened sceptical coverage of global warming, such as the "Daily Mail", became emboldened and more hostile. The BBC began to bend over backwards to balance scientific opinion with critics' counter-claims, often using the Global Warming Policy Foundation, a new contrarian think-tank founded just as the controversy broke" (Henderson, 2012).

21. It should be noted that a large number of UK national newspapers (none of whose editors have significant science qualifications or training) now promote climate change "scepticism" to some degree, with the "Daily Express", the "Daily Mail", "The Daily Telegraph", "The Mail on Sunday", and "The Sunday Telegraph", persistently publishing inaccurate and misleading information from "sceptics" in their print editions and on their websites.

22. One of the most important findings of the Leveson inquiry was that some newspapers publish intentionally inaccurate and misleading articles when promoting a political agenda. In his final report, Leveson stated: "I have come to the conclusion that there does exist a cultural strand or tendency within a section of the press to practice journalism which on occasion is deliberately, recklessly or negligently inaccurate". He also pointed out that "there can be no objection to agenda journalism (which necessarily involves the fusion of fact and comment), but that cannot trump a requirement to report stories accurately". Leveson added: "Particularly in the context of reporting on issues of political interest, the press have a responsibility to ensure that the public are accurately informed so that they can engage in the democratic process".

23. It is clear for their coverage that a number of right-wing newspapers consider climate change to be primarily an issue of politics, rather than of science, and therefore apparently take the view that their coverage need not be constrained by considerations of whether information is inaccurate or misleading (Ward, 2013b). It remains to be seen whether any new regulatory regime that may now emerge after the Leveson inquiry will uphold the public interest any better with respect to coverage of climate change.

24. It is also important to note that the coverage of climate change by UK national newspapers has decreased sharply since 2009. A monitoring project by the University of Colorado shows that the monthly number of articles in 2013 has fallen to a level not recorded since 2004–05 (Boykoff & Nacu-Schmidt, 2013). In addition, there has been a reduction in the number of environment correspondents in the UK media. For instance, "The Times" reassigned its environment reporter, Ben Webster, to cover media issues in 2011, and the BBC made redundant an experienced correspondent, Richard Black, in 2012.

The Impact of Climate Researchers on Public Understanding

25. Climate researchers also share responsibility for the decline in UK public understanding of climate science since 2009. In particular, they have failed to draw a line under the controversies surrounding the UEA e-mails and the IPCC (2007b) report. Rather than responding robustly to the allegations of incompetence and misconduct by strenuously defending the integrity of their profession, many climate researchers have withdrawn from the public debate, perhaps understandably fearful of becoming targets of attacks from "sceptics". Instead they have hoped that a series of official inquiries would set the record straight for them.

26. Although a number of separate reviews cleared the scientists at the centre of the "Climategate" e-mails scandal of scientific misconduct, they also criticised standards of transparency. Largely as a response to "Climategate", the Royal Society launched an initiative on "science as an open enterprise". The primary recommendation of its report, published in June 2012, was: "Scientists should communicate the data they collect and the models they create, to allow free and open access, and in ways that are intelligible, assessable

and usable for other specialists in the same or linked fields wherever they are in the world. Where data justify it, scientists should make them available in an appropriate data repository. Where possible, communication with a wider public audience should be made a priority, and particularly so in areas where openness is in the public interest" (Royal Society, 2012).

27. So there is now an opportunity for climate researchers, and their professional institutions such as the Royal Meteorological Society, to initiate a debate about how the Royal Society's report can be taken forward, seeking to make their profession a beacon of best practice in terms of openness and transparency.

Recommendations

28. The DECC should continue to monitor public attitudes to climate change, but expand its current range of questions and align them with the previous survey by the DEFRA in order to create a consistent long-term database.

29. Public understanding of the science of climate change could be improved if the Charity Commission holds the Global Warming Policy Foundation to account for disseminating inaccurate and misleading information.

30. Any new regulatory regime for the UK Press should seek to uphold the public interest by remedying the current situation whereby some newspapers apparently feel that they can promote, with impunity, inaccurate and misleading information about climate change.

31. Climate researchers should seek to serve the public interest by playing a more integral role in the process of public debate and policy-making, by (Ward, 2013c):

- engaging the public more effectively through direct and indirect methods;
- learning more about the information needs of the public (ie through two-way communication);
- improving the explanation and presentation to public audiences of challenging concepts such as risk and uncertainty;
- implementing a strategy for improving the reputation of the climate research profession for trustworthiness, particularly in terms of transparency;
- increasing efforts to influence the narratives on climate change that are being promoted by the media;
- dealing more effectively with criticisms of, and attacks on, mainstream climate research; and
- engaging policy-makers at international, national and local levels more effectively through direct and indirect methods.

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April 2013

Written evidence submitted by Sir Christopher Audland, KCMG, DL (CLC043)

INTRODUCTORY

1. The House of Commons Science and Technology Committee (hereinafter the S & T Committee) has announced its intention to hold an enquiry into what the public understand about climate, where people look for their information, and how that may impact on climate change policy; and it has invited written submissions. Such is the nature of the present document.

2. The invitation requires that each submission should include a declaration of interest. I served in the Foreign Office (& then the FCO) from 1948 to 1973, and was, from 1968 to 1970, Head of the Science & Technology Department, which handled FCO interests in all questions concerning the environment, the sea-bed and the peaceful uses of atomic energy. I served in senior positions as an Official of the European Commission from 1973 to 1986; and was for the last five of these years—which included the period of the Chernobyl disaster—Head of the Directorate General for Energy, which handled all energy issues. Since retirement, my relevant experience has been to serve as a founder Patron of "Supporters of Nuclear Energy (SONE)"; as Vice-President and later as Executive President of Europa Nostra—the leading European level Heritage NGO; and also as founder Chairman of Friends of Eden, Lakeland & Lunesdale Scenery (FELLS). Both of the two NGO's just mentioned oppose the construction of wind-turbines in inappropriate places.

SUBMISSION

3. In its call for submissions, the Committee drew attention to its own Report "Devil's bargain? Energy risks and the public" (Session 2012–13). That Report was fundamentally flawed. At no stage did it attempt to define the extent to which climate change is man-made. This has to be the key climate issue for anyone concerned with energy policy.

4. The published Terms of Reference of the S & T Committee's Enquiry record that "In 2006, 81% of surveyed UK citizens were fairly or very concerned about climate change, compared with 76% in 2,009 in an identical tracking survey". Even more striking are the results of a survey by GlobeScan Radar, published in February, 2013, of nearly 23,000 people in 22 countries, including the UK, which found that, since 2009, the proportion of people viewing climate change as "very serious" has fallen from 62% to 49%. In these circumstances, one would have expected that the very first question the S & T Committee would place before the Enquiry would be "Is it time for the British Government—and the EU Institutions which at present broadly agree with that Government's views on MMGW—to take a fresh look at the question to what extent climate change can realistically be regarded as 'man-made'?". Instead, each of the seven questions in the Terms of Reference take it for granted that man is largely responsible for observed climate change.

5. The British Government & the EU Institutions accept without question that there is a direct and close correlation between the volume of man-made Greenhouse Gases, especially CO_2 Emissions, on the one hand, and global temperatures on the other. It was on those grounds that they accepted, first the Kyoto Protocol; and, second, the target set by the EU Heads of Government to source 20% of all the Union's energy from renewable sources by 2020. The latter is held by the EU to require the UK to increase the share of renewables in our energy mix from 1.5% today, to 15% in 2020.

6. However, Parliament has chosen to go far beyond this challenging commitment, by imposing on the British Government the Climate Change Act of 2008, which lays upon the Secretary of State a duty to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline.

7. I would not for a moment argue that the human race has had no impact at all on the climate. But, in my submission, the whole idea of MMGW has been grotesquely exaggerated, by too many people, on the basis of highly questionable evidence, over the last quarter century. The world has been warming & cooling ever since it began, around 4.5 Bn BC. As the "Economist" has recently reminded us—see article on "The Cambrian Explosion" on p 87 of the 23 March Issue—during "The Snowball Earth" Era, which lasted from around 725 Mn. BC to around 541 Mn BC, there were a series of Ice Ages, which were, at their maxima, among the most extensive glaciations in the world's history. They alternated, though, with periods when the planet's average temperature was sometimes as high as 50 Degrees C. None of this was due to MMGW. Man was simply not

around in those days. The first Homo Erectus, predecessor of Human Beings (Homo Sapiens), emerged around BC 2 Mn. Homo Sapiens came into existence in Africa ca. 200,000 BC, and rapidly spread round the world.

8. Between 1975 and 1998, there was clearly a rise in world average temperatures. In the latter year, therefore, it could have seemed reasonably logical to suggest that this was due to the rapidly increasing global emissions of CO_2, which averaged 1.5 ppm per annum over that period (NOAA data).. In 1998, however, the increase of world temperatures halted. Since then, for 15 years, global average temperatures have been virtually static. During the same period, global CO_2 emissions rose even faster, at 1.85 ppm per annum, or almost 8%. The argument that CO_2 emissions contribute to an important extent to climate change has therefore been steadily weakening, year by year, for 15 years, and is no longer valid.

9. Most reasonably well informed people are aware of the UN Framework Convention on Climate Change of 9 May 1992. Its ultimate aim was declared to be the stabilisation of greenhouse gas [GHG] concentrations in the atmosphere at a level which would prevent dangerous anthropogenic interference with the climate system. It was followed by the Kyoto Protocol (to the Convention) of 11 Dec 1997. This set targets, though for Developed Countries only: amongst the latter, moreover, there were notable exceptions from the ratification process, including the USA & Australia. The key aim was that Contracting States should—over the period 2008 to 2012—each reduce their GHG emissions by 5% compared with 1990.

10. In December 2007, there took place in Bali a Conference of the Parties to the Kyoto Protocol, along with certain other countries, making a total of over 180 States. This Conference took into account the work of the International Panel for Climate Change (IPCC). It agreed two key documents. The first was the Bali Road Map. This envisaged the preparation of a new Agreement on Climate Change, intended for adoption at a similar conference in Copenhagen in December 2009. The preparatory work was entrusted to an Ad Hoc Working Group on Long-Term Cooperative Action [AHWG-LTCA]. The Working Group was asked to provide a progress report in time for consideration at a similar conference in Poznan, Poland, in December 2008. The second was the Bali Action Plan. This document is essentially a list of rather general ideas to be studied by the AHWG-LTCA.

11. In December, 2009, there took place in Copenhagen another Conference of the Parties, which achieved nothing much, except for agreement to continue the work of the AHWG-LTCA. There were further such Conferences in Cancún (2010), Durban (2011) and Doha (2012). The last one agreed to extend the Kyoto Protocol to 2020, and to set a date of 2015 for the development of a successor document, to be implemented from 2020. Otherwise, the Parties have achieved remarkably little.

12. The work of all these Conferences has been prepared by the IPCC. Its Reports have been the subject of much criticism by scientists, and other people in a position to understand climatological questions. In its 2007 Report, for example, the IPCC made the central claim that the world's glaciers were melting so fast that those in the Himalayas could "very likely" vanish by 2035. This was at once sharply contested by many scientists. And, in January, 2010, the IPCC itself released a Statement acknowledging that, in the case study on the Himalayan glaciers, "the clear and well-established standards of evidence, required by the IPCC procedures were not applied properly". In other words, they admitted that the claim was unsustainable. It has been suggested that the figure resulted from the mis-reading of the figure 2350 from an earlier Report.

13. The attitudes of the IPCC have been criticised by, inter alios, Professor John Beddington, who was appointed in 2010 as the Government's Chief Scientific Adviser. In an Article published by "The Times" on 27 January of that year, he said that climate scientists should be less hostile to sceptics who questioned the theory of MMGW. "I don't think it's healthy to dismiss proper scepticism. Science grows and improves in the light of criticism. There is a fundamental uncertainty about climate change prediction that can't be changed. Certain unqualified statements have been unfortunate. We have a problem in communicating uncertainty. ... All these predictions have to be caveated by saying: 'there's a level of uncertainty there'".

14. In June 2011, the Global Warming Policy Foundation published a Report on climate change by Lord Turnbull. Few people could speak on this subject with more authority: Lord Turnbull was, successively, Head of the Department of the Environment (1994–98), then Head of the Treasury (1998–2002), and finally Cabinet Secretary & Head of the Civil Service (2002–2005). In his Report he stated the following. There is huge controversy about the relative contribution of man-made CO2 versus natural forces such as the sun, cosmic rays, clouds and the oceans. Many scientists would support an alternative hypothesis that the globe has been on a gentle warming trend since the end of the Little Ice Age around two hundred years ago, with alternating periods measured in decades of faster and slower growth, or even periods of moderate decline. Such an alternative view would not justify the alarmism which characterizes much of the public debate. The Really Inconvenient Truth is that the propositions of the IPCC do not bear the weight of certainty with which they are expressed. However, he wrote, the purpose of his paper was not to argue that there is another truth which should become the new consensus, but to point out the doubts that exist about the IPCC viewpoint, and the serious flaws in its procedures. It was also to question why the UK Government has placed such heavy bets on one particular source of advice. The economic policy choices being made would not minimize the cost of mitigation. The paper concluded with a call for more humility from scientists, more rational reflection from politicians, and more challenge from our parliamentarians.

15. On the other side of the Atlantic, in the USA, 31,000 Academics have signed a petition to the US Government rejecting the idea that man has been responsible for Global Warming. 9,000 of them hold Ph D

Degrees, mostly in Engineering. The Petition was first adopted in 1998, and re-adopted in 2007. Issued by the Oregon Institute of Science and Medicine in response to Al Gore's film on Climate Change, "An Inconvenient Truth", it says that "There is no convincing evidence that human release of GHG is causing, or will, in the foreseeable future, cause catastrophic heating of the Earth's Climate". A similar statement was made by over 500 scientists, researchers, economists & policy makers, who attended an International Conference on Climate Change at New York on 4 March, 2008. (The Manhattan Declaration). It said, inter alia, that, in the historical record, the rise in CO_2 [levels] has always followed periods of warming (as the effects of disturbances on the Sun and the Earth created more CO_2); and not preceded them, as the man made global warming (MMGW) theorists maintain. It likewise declared that "there is no convincing evidence that CO_2 emissions from modern industrial activity has in the past, is now, or will in the future, cause catastrophic climate change".

16. In spite of this widespread and increasing scepticism about MMGW, the British Government and the EU—which both subscribed to the Kyoto Protocol—continue to hold that GHG, & notably CO_2 emissions, should be reduced. They argue that Scientific Research has shown, after coring the Antarctic ice for 3 kilometres, covering 740,000 years, that today's greenhouse gas levels are the highest for 440,000 years; and that much smaller increases have been linked to a significant degree of global warming. CO_2 levels hover around 200 parts per million [ppm] during ice ages, and 280 ppm during interglacial periods. Now they are around 394 ppm. They choose to ignore the scientific theory—see paragraph 15—about the relationship between past rises in CO_2 levels, and their having followed periods of warming and not preceded them,.

17. The problem of GHG emissions of human origin must, in any case, be kept in correct perspective. The world's climate is always at risk from other causes—for example a meteor strike. GHG can emerge in nature—eg through massive volcanic explosions, as at Krakatoa. And they are by no means the only influence on our climate. Sunspots constitute another major one. For 12,000 years we have been in the run-down from the last ice-age. Glaciers have been receding. But there have been speed-ups and slow-downs in the process—often very large. There were mini-Ice-Ages in the Dark Ages (540–950); and again between 1300 and 1850. These produced intense cold, untimely frosts and widespread famine. The production of GHG in that period was insignificant by comparison with today. It should also be borne in mind that fossil-fuel burning is not the only source of CO_2 emissions. Currently 7,333 MT of CO_2 are released annually, as forests are destroyed. (The latter process is politely called "change of land use"). American researchers have also discovered that the amount of water high in the atmosphere is far more influential on world temperatures than previously thought. A study, published in the journal Science [January 2010], says that a 10% drop in humidity 10 miles above the Earth's surface explains why global temperatures have been stable since the start of the 21st century, despite the rise in carbon dioxide in the atmosphere. A rise in water vapour in the 1980's and 90's may also explain why temperatures shot up so quickly in the previous two decades, they say.

18. It seems clear that the last global cold spell ended in 1975. The argument for climate change is therefore based on only 37 years of experience. But Global warming ceased in 1997, and has not since resumed. In short, temperatures across the world are not increasing as they should, according to the fundamental theory behind global warming—the greenhouse gas effect. Something else is happening, and it is vital that we find out what; or else we may go on spending hundreds of billions of Pounds, Euros or Dollars needlessly. One is led to the conclusion that either the hypothesis of global warming induced by carbon dioxide holds, but its effects are being modified in some unexplained way; or else the working hypothesis does not stand the test of data. That is what the S & T Committee should be considering.

19. Writing as one who was the Senior Official in the European Commission's then Directorate-General of Energy. I would argue that neither the EU nor the British Government today have any coherent energy policy. It is blindingly obvious that—if the lights are to be kept on—the British Government will have to change direction. It is appalling that the said Government, which claims to accept the need for more nuclear power, has not brought about the start of building a single nuclear power reactor since the last one was opened at Sizewell in 1995. The Government has also achieved no progress towards the creation of underground storage capacity for the disposal of high level nuclear waste.

20. The EU, the British Government, and all the UK's main Political Parties have, ever since the Kyoto Protocol of 1997, committed themselves to the theory that CO_2 emissions have a major impact on the world's climate. The Government has spent colossal sums of money on trying to reduce those emissions. Much of this money has been found by levies on British energy consumers. It is understandable that the Government should now be reluctant to admit that their claims regarding the impact of CO_2 were grossly exaggerated. But it is also inexcusable that the S & T Committee should avoid even considering the issue at all, whilst itself recognising that a massive & growing proportion of the electorate have grave doubts about the matter.

April 2013

Written evidence submitted by the Green Alliance (CLC044)

Green Alliance is the UK's leading environmental think tank working to ensure UK political leaders deliver ambitious solutions to global environmental issues.

We understand political decision-making and have helped to change policy, bringing climate change and environmental issues into the mainstream.

While not a formal alliance we work closely with partners in the third sector, business and other spheres to advocate proposals influential on all sides of the political spectrum.

Our two main reports on public understanding of climate and policies are:

> *Neither sermons nor silence: the case for national communication on energy use* (an analysis of government communications on energy change).[66]
>
> *What people really think about the environment: an analysis of public opinion* (an overview of different polls and analyses on the public's attitude towards climate change and the environment).[67]

What is the current state of public understanding of what is meant by climate change? How has this changed in recent years?

There's no question that, when asked to choose which issue is most important, more people now say "the economy" and fewer say "environmental issues" than before the financial crisis. At its January 2007 peak, 19% of the population rated the environment as the most important issue facing the country. In the face of the economic downturn, this has slid to below four%. However the true story of this decline is more complex, as our report *What people really think about the environment: an analysis of public opinion* has argued.[68]

Given the dramatic nature of the economic crisis, the direct effects felt by many, and the sustained media focus, it is hardly surprising that, when asked to choose one issue, people choose this. But, as Paul Flattery, managing partner at trend analysts Trajectory has said, "this doesn't mean that people don't care" about the environment and climate change. In fact, in 2010, 71% of people were still very concerned or fairly concerned about climate change, and two thirds believe that it poses risks to people in Britain.

And the number of people who think climate change is a "very serious" problem has begun to rise again from 43% in 2010 to 49% in 2011. When asked about the greatest problems facing the world (rather than just Britain) people in the UK are more concerned about climate change than the economy. Forty four% of respondents to a 2011 Eurobarometer survey said that climate change was the single biggest problem facing the world, while 39% said the economic situation. This represents a shift from 2008 (when 57% said climate change and 24% the economy), but shows that UK citizens still view climate change as the greater global priority.

Part of, not against, the Economy

However, framing the question in terms of absolutes and asking people to choose which single issue matters most will always provide overly simplistic answers. Asking people to rate the importance of the economy vs environment is likely to underplay the seriousness of environmental challenges. In reality, they are indivisible, as a successful economy is fundamentally dependent on a healthy environment for raw materials, resources such as water, and a stable climate.

In terms of UK policy decisions, abstract concern about climate change is not as relevant as people's feelings about solutions. When it comes to green behaviours, we can see that interest and action is growing.

The number of people in the UK claiming to take energy efficiency measures has steadily increased in recent years, from 41% in 2004 to 61% in 2009. DECC figures show that the number of homes with loft insulation thicker than 125mm increased from 9.5 million in April 2007 to 13.4 million in July 2011, largely due to DIY and professional installations in existing homes.

After a nationwide series of deliberative forums about micro-renewables and energy efficiency in 2009, Ipsos MORI concluded that "Householders are excited by the new technologies, considering them technologies of the future and, in general terms, a 'no brainer'". There is also enthusiasm for a shift in the way we pay for energy, with 61% of UK respondents to a 2011 Eurobarometer survey agreeing with the statement that "taxation should be based more on the way we use energy."

Recycling has become normal practice in the last decade thanks to a mixture of better infrastructure and education (driven by the landfill tax and EU directives). Forty% of household waste in England is now recycled. In 2004, 45% of English householders classed themselves as "committed recyclers"; by 2011 this had risen to 70%.

[66] http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/Neither%20sermons_FW.pdf
[67] http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/Green_affordable_Pol_Ins_singles.pdf
[68] http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/Green_affordable_Pol_Ins_singles.pdf

NOT JUST A LUXURY

It would be wrong to assume that it is just the middle classes who care about sustainability and are taking these green actions. In fact, in an Asda survey, their customers on the lowest incomes, from socio-economic categories D and E, were the most likely of all groups to say they "care very much indeed" about being green.

Many sustainable behaviours have become normal even in households that are struggling financially. The Asda survey respondents on lower incomes were as likely as the wealthiest groups to say that using less energy and water at home was "normal" or "intelligent", with 67% holding this view. Lower income customers were also as likely as their wealthier counterparts to say that it is "intelligent" to drive a greener car and avoid flying on holiday (20% and 10% respectively).

This interest in sustainable living from people who are less well-off clearly derives, to some extent, from an interest in saving money. Many behaviours that have a lower impact on the planet also make less of a dent in people's finances. As the Asda report says "Austerity Britain hasn't pushed green issues off the agenda, instead it's made saving energy and cutting waste…the new normal." But this is not the only motivation. Wanting to "do the right thing" is the main reason that Asda customers gave for buying green products, across all income brackets. On average 79% said this was their primary motivation. And this feel good factor is most powerful for lower income households (83%).

Interest in green living also extends to the half of the population who belong to socio-economic categories C1 (lower end white collar workers) and C2 (skilled manual workers). They are only marginally less interested in sustainable living than their poorer and wealthier counterparts. This is important politically as, according to The Economist, this "misinterpreted middle" is crucial to deciding elections.

Opinion polls and surveys also show that people are largely willing for, and actually expect, government and businesses to take a bigger role in moving them towards green living. Specifically, they expect government to set out a vision of a sustainable future that their policies will help to build, and to help citizens to play their part by making greener choices easier.

However, it is not clear that government policies are responding to these messages.

What role should Government Departments, scientific advisers to Government and publicly funded scientists have in communicating climate science?

Our report *From hot air to happy endings* identified the most effective ways for politicians to communicate the possibilities of a low carbon society.[69] These were:

- Be positive about the opportunity rather than negative about the risk.
- Ensure that change is visible and that government leads by example.
- Be clear and consistent.
- Work to the values of different audiences, tailoring to the cultures being addressed.

This means going beyond the words of scientific advisers and looking into how to portray their messages in a way that shows the opportunity, that the public can understand and which they can apply to their own lives.

Our work on *Green Economy: A UK Success Story* focused on communicating the economic benefits the UK is currently receiving from its transition to a low carbon society.[70] While the costs of transition are often debated in the public eye, and the risks of not adapting are clear, government could do more to champion the advantages of moving to an economy that sees us doing more with less and in which we export more green goods to China, Brazil, India and Germany than we import from them.

What evidence is there that public attitude to climate science affects their engagement with energy policies or initiatives?

There have been vast strides in the understanding of behaviour change theory and its application to policy design and delivery over the past few years. The inability to shift behaviour through information alone is now well understood. As a result, broad brush environmental campaigns, unsupported by enabling policy, are a thing of the past. Instead, government has focused on developing a range of consumer facing policies that will support householders in reducing their energy use.

They include:

- Electricity microgeneration feed-in-tariff (FiT).
- Household Renewable Heat Incentive (RHI) and Renewable Heat Premium Payment (RHPP).
- Green Deal.
- Energy Company Obligation (ECO).
- Smart meter roll-out.

[69] http://www.green-alliance.org.uk/uploadedFiles/Publications/Hot%20Air_online(2).pdf
[70] http://www.green-alliance.org.uk/grea_p.aspx?id=6629

These schemes provide people with valuable practical support. But they are missing a vital ingredient, as their communication has not been properly thought through.

All of these schemes encourage changes in behaviour, or to the home's fabric or source of energy, with the objectives of reducing carbon emissions, tackling fuel poverty and improving energy security. The rate of uptake needed to meet government targets is highly ambitious. It requires one home a minute to upgrade its energy efficiency between now and 2050, just under two homes an hour to install renewable heat between now and 2020 and ten homes a minute to have smart meters installed between 2014 and 2019.

Achieving this will depend on the public actively engaging with the schemes and taking actions, which include spending their own money. A range of approaches and interventions will be needed to drive uptake and to secure sustained changes in people's behaviour around energy. These include fiscal and regulatory levers and incentives. But policies will fail if the public does not respond to them in sufficient numbers. Effective communication is therefore central to ensuring success.

There are behavioural barriers to uptake and the track record of demand for energy efficiency measures is low, even when they are being heavily subsidised or given away. So, the availability of new schemes will not automatically result in high levels of uptake. Co-ordinated communications are needed that are visible, consistent, provide context, are trusted and help to change social norms.

Our report *Neither sermons nor silence: the case for national communication on energy use*, argues that only national level communications can achieve this and that current government plans for multiple and dispersed communications will not be effective.[71] It draws on the learning from national campaigns in the UK and abroad.

Why national communications are necessary

The need for national communications is further evident when assumptions about trust and building consumer acceptance are interrogated in more depth. Energy suppliers will be leading the smart meter roll-out and many of them will be Green Deal providers as well. Yet only 16% of people trust energy companies to deliver messages on energy efficiency. Consumer Focus has also found a "lack of trust and a widespread negativity" amongst consumers towards energy companies.

Government research into consumer views on the Green Deal noted that "in order for the Green Deal to enjoy widespread acceptance it was felt that endorsement by a trusted source was needed." Participants in the research had made an "automatic assumption" that the government would play this visible, trusted role. Green Alliance research on the Green Deal reinforces this, with local authorities and civil society organisations saying they would be hesitant to align themselves with a private initiative and to be seen to be endorsing a particular brand or product rather than an overall scheme.

From a purely practical point of view, it is unrealistic to assume that community organisations, or even bigger charities, will be able to work simultaneously with a range of providers. The digital switchover campaign, for example, worked closely and intensely with a range of organisations over defined periods of time, and all of our featured case study campaigns were better able to engage trusted partners by virtue of having a single point of contact.

Green Deal

Our look at the Green Deal ahead of its launch (*Getting a good deal from the Green Deal)* involved working with three MPs in their constituencies on likely barriers to the Green Deal's deployment that could be easily rectified.[72] Local people's issues had less to do with their understanding of climate science and more to seeing how the broader benefits of energy efficiency could appeal to them.

The five main ways of ensuring success were identified as:

- Help to encourage take-up.
- Give more support to the fuel poor.
- Make sure local economies benefit.
- Spread the message.
- Help to drive real demand reduction.

Our report concluded that the Green Deal certainly has great potential to reduce the amount of energy we use in our homes and businesses, but our workshop participants were not convinced that it could be the whole solution to reducing energy use and creating warmer homes in their areas.

For local groups and businesses to support the proposals they needed to see a tangible local benefit, feel supported in their engagement, and know that the delivery of the scheme is fair and will help all sectors of society. They also needed to see that their action is part of a broader programme and receive clear support from central government through incentives and messaging.

[71] http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/Neither%20sermons_FW.pdf
[72] http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/Briefing_green%20deal_FINAL.pdf

Our report, *Bringing it Home*, looked at how government policies on energy, water and waste were acted upon in the home.[73] Through case studies and consumer analysis in real homes, it examined whether householders' behaviours are changing, and what could make them better.

Amongst our households it was clear that some green behaviours are much more common than others. Recycling was the greatest success story, although there is still a way to go on reducing or separating out food waste. There was a broad awareness of the need to save energy, even if there is less actual action. But the householders had almost no knowledge of the need to save water and were confused about how this could be done. On a national level, we found that more effort is needed on every front to help householders play their part in the transition to a low carbon, resource efficient society.

The report concluded with three principles for greener living:

1. *Set out the vision*

   For a change strategy to succeed, the target audience needs to believe in it and understand how they fit into the plan. The perceived benefits of action to protect and improve the environment are not always evident at an individual or local level. The onus is on government to provide a clear vision and bold leadership.

   A lesson from the behavioural sciences is that people will take action if they see others also doing so and feel a sense of fairness. Policy will be most effective if people believe that national government has a credible vision and a plan to support their own efforts. They also need to see the government putting in corresponding effort, and receive benefits from doing the "right" thing.

2. *Transform the "choice architecture"*

   The magnitude of the environmental challenge and, specifically, the imperative to tackle climate change within a relatively short timescale, requires a step change in how we manage resources in our homes.

   The structures within which we operate need to change to ensure this can be achieved. Otherwise incremental improvements in the environmental performance of products and services, and efforts to nudge us in the right direction, will be drowned out by increasing consumption. Systemic problems need a systemic approach, rethinking the markets within which people are making their choices about their use of energy, waste and water, and the products and services available to them. These changes will not come about without clear leadership from government.

   The effectiveness of recycling policy has demonstrated the importance of structural change. Changing the structure within which businesses and local authorities operated through the landfill tax and tough targets has resulted in the uptake of recycling across the country, amongst different sectors of society and values groups. It has led to the introduction of new infrastructure, behaviours and social norms, which have contributed to meeting ambitious targets.

3. *Apply behavioural insights for smarter policy*

   A more sophisticated understanding of how people behave enables the development of more intelligent, more effective policy. Nudge will be helpful in encouraging pro-environmental action but it will be insufficient on its own. Without a reappraisal of existing approaches and the application of behavioural insights to a broad set of policies, government will not be able to reach its stated ambitions within the necessary timescale.

   Policies aimed at driving greener living should be re-examined through the lens of behavioural science. The aim of such policy measures should be to use the best of the evidence base to encourage desirable behaviours and to discourage undesirable ones. While the nudge approach has something to offer this process, it cannot replace policy which helps to create new choices or makes damaging behaviour difficult or impossible to pursue. Successful initiatives are likely to need all the policy tools available; a mix of well-designed information, incentives, regulation, services and nudges to encourage the desired actions and outcomes.

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[73] http://www.green-alliance.org.uk/grea.aspx?id=5592

Written evidence submitted by Professor Erik Bichard, University of Salford (CLC046)

1. I have been doing research with the Environment Agency since 2009 to try to determine why owner-occupiers have failed to heed the warnings and advice given to them about the effect of climate change. This work has included understanding reactions to both calls to invest in property-level flood protection, and various schemes to influence improvements to the energy efficiency of housing.

2. The work first involved attitudinal studies to determine whether householders understood that climate change was taking place, and where they attributed the responsibility to minimise its effects. The surveys also asked if householders would act to purchase measures to protect their houses against the effects of climate change, and if not, whether a range of non-cash incentives would motivate them to take a different view. Later, a trail was carried out in a community to test the whether the motivation strategy that was followed from the survey findings would be effective in the field.

3. The attitudinal studies showed that residents did understand the seriousness of climate change and thought that they had a personal responsibility to address it. However, they also thought that government was responsible. While apparently incompatible, these two statements are understandable when interpreted against norm-based behaviour. This would allow individuals to act on well formed attitudes provided they believed that others were equally committed to the action.

4. The attitudinal part of the research also found that householders would respond positively to incentive schemes that encourage them to purchase energy-saving measures for their homes (Bichard and Kazmierczak, 2009). This approach is a departure for local and national regulators and legislators in the UK that have traditionally relied on a combination of strategic legislation, public information in national campaigns, and targeted funding and subsidies to help home-owners to lower their energy consumption, carbon emissions, or protect their homes against flooding.

5. This shift in emphasis towards methods more aligned to the theories of behavioural economics than public information is exemplified by the interest that government departments are taking in this approach. Reports such as "Behaviour Change and Energy Use" was promoted by both the Departments of Energy and Climate Change (DECC) and Communities and Local Government and was produced by the Cabinet Office's Behavioural Insight Team (Cabinet Office, 2011). The report discusses the significance of all three strategy elements that are tested in this paper including better use of information, incentives and norm-based behaviour.

6. The many basic measures energy conservation programmes and the current Green Deal rely on a range of building fabric and technological interventions to achieve energy conservation and carbon reduction targets. However, there is growing evidence including work I have just completed at the Salford Energy House that suggests that behaviour can account for at least 30% of gas consumption, and over two-thirds of electricity consumption.

7. This suggests that the delivery partners of retrofit programme to improve energy efficiency of buildings will need to employ a strategy that both educates and motivates residents to the offer. Motivation strategies will be required because, despite numerous government messages, many millions of homes in the UK are not energy-efficient due to the absence or minimal presence of insulation and inefficient heaters and appliances (Department of Energy and Climate Change, 2010).

8. The studies for the Environment Agency were undertaken within the "Resilient Homes" programme. The programme sought to help the Agency to become better equipped to engage with neighbourhood groups in ways that would persuade them to understand and act upon the threats from climate change on their properties and their lives. After establishing clear attitudinal tendencies towards personal responsibility and interest in responding to incentives, the project undertook a trial in a neighbourhood in Timperley, western Greater Manchester. The Phase 1 report (Bichard and Kazmierczak, 2009) presented clear evidence that an incentive scheme based on non-cash rewards could be successful. However, this had to be balanced against the usual caution about attitudinal work.

9. It is often the case that there is a gap between what people say they would do in answer to a survey question, and what they actually do when faced with a decision. This is particularly true when the decision requires respondents to spend their own money. Hence, the Environment Agency concluded that there was merit in the proposition, but that a limited "proof of concept" trial needed to be mounted to show that householders could be persuaded to buy energy or flood measures in response to an offer of a reward. Thus, the project team designed a pilot directed at a limited number of streets in a flood-threatened area. Although the project team examined ways of persuading householders to purchase flood protection and energy efficiency measures in addressing the effects of climate change this paper mainly considers the aspects related to energy efficiency measures.

10. The attitudinal survey of the Timperley residents showed a marked similarity to other telephone and door to door surveys that have been carried out by the project team since 2009. Following dissemination of the Phase 1 report, the Salford team were asked by the Agency to test the conclusions of the attitudinal work by running a limited trial in a few streets. The district of Timperley in western Greater Manchester was chosen as it was assessed as flood-threatened, did not have an organised green community group, and was likely to produce sufficient numbers of owner-occupiers with enough disposable income to participate. The local authority, Trafford Borough Council were consulted and decided to contribute additional funds to the study.

11. The trial was designed in three parts. First, residents were visited by a green community group acting on behalf of the researchers who tested householders' attitudes toward climate change, attribution of responsibility, and interest in investing in property-level measures in return for some non-cash rewards.

12. Residents who expressed interest in the reward scheme were given a combined flood and energy survey of their home. The residents were then invited to purchase some or all of the recommended measures in return for rewards such as vouchers for fruit and vegetables, free meals at a local restaurant, free furniture and garden makeovers, valued at the same amount as their expenditure.

13. The core attractor for residents was the incentives. Each reward had an intrinsic sustainable value and some were linked to public policy initiatives—for example using offender rehabilitation schemes for the labour on the furniture and garden makeovers.

14. The trial involved a small sample of 50 homes to prove the concept was viable and so was never expected to produce large numbers of converts. However, it produced some interesting and unexpected results. Half of the householders agreed to a full energy and flood audit. This is far higher than one energy company achieved after offering to provide this for free to their own customer base.

15. The residents who accepted the rewards chose fruit and vegetables, a season ticket for the tram, a garden makeover and a beauty session in return for buying items including a new boiler, space heaters and insulation. About 20% of those householders who accepted the home surveys went on to make a purchase and hence were eligible for the rewards. The average spend by the residents was just over £1,000 while the cash value of the rewards was £840 showing that it is possible to motivate reluctant householders, promote social value initiatives, lower carbon emissions and provide measures at less than market prices for the material and the labour all at the same time. The team is now speaking to a number of energy providers and other interested parties about extending this work. The result are contained in the Phase 2 report submitted to the Environment Agency and Trafford borough Council (Bichard and Thurairajah (2011).

16. The lessons from the Timperley study show that it is not necessarily the content of information sources, or even their presentation that is significant in the motivation towards retrofit action. Rather, the timing, tailoring, and the source of the information appeared to be the crucial aspects in the efficacy of education and awareness material. The project team identified three potential key intervention points when attempting to motivate property-level investment. These were:

- Information at the point of decision on whether to allow surveyors into the house.
- Information at the point of decision on whether to take up some or all of the surveyor's recommendations.
- Information on how to behave differently once the measures have been obtained.

17. The study found that face-to-face interaction with householders is an essential component, but that interventions need to be timed to meet householder needs. In addition, programmes that assume standard contact points will often fail many householders who have different needs at different times. For suppliers involved in delivering the Green Deal, this finding could have significant cost implications. Commissioning bodies would do well to ensure that suppliers have factored sufficient contact time into their delivery programmes to accommodate this tendency.

18. A further finding was that the strategies employed in the trial lead to a significant number (around half of all participating households) allowing survey teams through their doors. The project team concluded from this that time spent talking to householders at their own property, offering tailored information (in response to questions) from a trusted source, and with the promise of rewards that capture the imagination were an effective combination to overcome doubts about the proposition. The information in the questionnaire, listing as it did all of the common interventions for energy and flooding, seemed to help residents to understand the nature of the request and lead many to move to the next stage.

19. The second decision point, choosing to act on the report recommendations, was facilitated by a hand delivered copy of the report, and a brief face-to-face explanation of its contents. This was supplemented by follow-up telephone calls to those who were slower to make up their minds. The evidence at this stage is that those who opted to purchase measures were probably already convinced that they wanted energy saving products either through the early interactions with the co-ordinator, or by talking to the energy surveyor who also spent time answering residents questions while on the premises. Persuasion beyond this point was more difficult, probably because of technical and financial barriers were beyond the abilities of the co-ordinator to overcome. However, it is conceivable; even likely, that there will be residents in future programmes who would need encouragement to read/re-read their reports and make a decision, possibly with supplementary advice from their trusted source of information.

20. The issue of trust was also raised by some residents who commented that being approached by a community group with University backing reassured them that there was no commercial "catch" to the scheme. Nevertheless, one resident reported that he still heard other residents say they were suspicious of the scheme because they had recently had to contend with many energy companies trying to get them to switch providers or buy energy saving products and this had made them defensive.

21. The factors that worked against the acceptance to buy energy measures included a perception that the cost of energy saving measures was prohibitive, and a belief (against the surveyor's finding) that the measures the resident had in place were sufficient. Another reason for declining the offer was the disturbance that would be caused from (for example) moving possessions out of the loft space, or the mess caused by cavity wall insulation work. One resident was suspicious of cavity wall insulation and thought it would cause his walls to become damp, a common concern although rarely justified. These are all well documented reasons for inaction on energy conservation.

22. Some residents who declined to participate in the door-to-door questionnaire, and others who failed to respond to their audit reports said that they could not spare the time to get involved in the project. While some may have used this response to avoid becoming involved on something that did not interest them, others who said were interested in climate change and were prepared to participate in the project found that they could not devote the time to consider the issues. A few were motivated to select measures and install them in their own time thus avoiding the need to wait for contractors. Others said that they were positively influenced by their interaction with the project and would, if time allowed, consider improving their homes in the near future using the recommended measures in their report as a guide.

23. The difficulty in overcoming resistance in time-poor households is a perennial problem for many public policies that require the public to concentrate for a period of time in order to assimilate the message and change their behaviour accordingly. The offer of incentives appears to have had the ability to attract, or at least intrigue some residents and draw them into the next phase of the project. The 50% acceptance of home surveys provides some encouragement to strategists considering how to improve access for future programmes such as the Green Deal.

24. The trial in Timperley relied largely on offering all the rewards tested in the attitudinal work in 2009. Only furniture refurbishment and beauty sessions (offered as a suggestion by Salford College) were added to the Timperley list. There was no apparent dissatisfaction with the fact that all of the non-cash rewards had some kind of intrinsic sustainable value. Some residents in the Timperley Trial were unclear why cash grants or a more direct form of incentive could not be offered, while others made suggestions for rewards without sustainable value. This followed the pattern of responses in the earlier surveys. Similar to earlier findings, fruit and vegetable vouchers were the most popular choice both in the attitudinal work and in the take-up of rewards after purchases were made. Residents implied that this was an easy choice as it was a constant need and saved them money.

25. Since it was noted from previous surveys that residents are willing to speak to people who lived relatively locally and intended to give an impression that the project only want make the trial success and not any other, the project team selected a local organisation as their delivery body. In addition, the majority of Timperley residents said they would be interested in attending a "green" community meeting. The combination of a green community group's involvement and the invitation to join a new local environmental group was designed to provide evidence that there was pro-environmental activity in the area and that acting in this way would not be a lone activity.

26. The literature suggests that there is evidence that strategies such as incentives that use motivation routes beyond education and awareness to persuade home owners to invest in energy conservation measures can be effective. The results from the Timperley trial would appear to support this although work on a larger scale would need to be completed before this could be conclusively confirmed. More research is also needed in key areas to refine this conclusion such as norm-based effects of pro-environment community groups, different types of incentives, and overcoming other barriers such as insufficient time to reflect on the issue, and overcoming mistaken beliefs that individuals have already addressed their obligations to conserve energy.

27. The literature also confirms that policy-makers in the UK are beginning to consider the theories and methods that have been proposed by behavioural economists and social psychologists when designing strategies to influence public domestic action on energy conservation. However, to be effective these disciplines need to be integrated into campaigns early and regularly. The Timperley Green Homes trial and the attitudinal work that underpinned it is one example of how some of this thinking can be applied to policy formation. When compared against the five questions derived from the Theory of Reasoned Action the priorities for new campaigns begin to emerge.

28. It appears (from the results of the Trial) that residents understand that there is a link between energy consumption, flood protection and adverse impacts from climate change. Many also have at least a shared acceptance for attribution and know how to address this in terms of mitigating measures for their home. However, there was little evidence that residents believe that others consider this a pressing problem and hence they may not be investing enough emotional energy into the issue for it to register above other spending priorities.

29. Public policy-makers who wish to engage a larger proportion of owner occupiers may need to design more complex intervention strategies. The Timperley Trial results suggests that this should contain a combination of information delivered at key moments in the decision-making process, incentives, and norm-based influences has the potential to help motivate the owners of domestic property to invest in energy-saving measures. However, this strategy needs to be delivered within the context of affordable materials and installer

costs. In addition, trustworthy energy auditors will need access to homes where the owners mistakenly believe that already have purchased sufficient measures, and convince them to improve the efficiency of their homes.

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April 2013

Written evidence submitted by John D Taylor (CLC048)

1. I am retired and apart from still being a fellow of the Institute of Directors and having an interest in Amateur Radio I am not connected to, or funded by any other organisation or party.

2. Many years ago when the government of the day was proposing to drastically alter the way we live (wind farms c02 taxation and restrictions on the emissions of greenhouse gases) I decide to research the scientific basis for such dramatic action.

3. Unfortunately I was frustrated in this endeavour as it soon became obvious that there wasn't any basis (there was no solid physical evidence to support manmade global warming) and that the voices the government was listening to was not that of dispassionate scientists but that of advocates with an agenda, either to raise funding for their pet projects, or from those with a quasi religious fervour to Save The World

4. Now many years on the world's population has increased by 50% and the 7 billion of mankind is now consuming fossil fuels at an extraordinary rate but Mother Nature has not responded to this massive influx of carbon. Temperatures have been flat for years and winter temperatures are now falling as the world enters a colder cycle

5. The Academics were wrong in 1970 to predict global cooling and they are wrong now to predict global warming, with new studies emerging on an almost daily basis, some with far reaching implications, it will be years before a better understanding of the climate emerges

6. As an example. The assumption has always been that more CO2 would increase temperature which would cause more water vapour to raise the temperature further(positive feedback)

> About five years ago an East European Physicist said this was wrong and that his mathematics indicate that water vapour would fall (negative feedback) and that Radio Sonde Data backed this up.
>
> Now Satellite data Release by NASA show that he was right and water vapour falls with rising CO2.
>
> This means that all the climate models are based on an incorrect assumption and therefore everything we have been told by the Government and their Scientists is (To put it mildly) badly flawed
>
> There is also growing evidence that what we are seeing is not just s standstill in global temperature , but the start of a much colder period,. this view is supported by many, such as NASA, The Russians (K.Adbusamotov of the Pulkovo Observatory, V Baschkin)& R Galiulin of the Research Institute Vnigaz), Prof Don Easterbrook of Western Washington University and even the Met Office who admit that they cannot see any change before 2017

7. I hope they are wrong I hope that someone somewhere in government is planning for the possibility of much colder weather because that really will be a disaster scenario not seen for a couple of hundred years FAMINE

8. We can now see that there is no connection between CO2 and temperature, which reinforces the findings of the VOSTOK ice cores (that CO2 lags Temperature).

> The temperature rise of the last hundred years has been 0.8 degrees Kelvin
>
> This is a change of 0.3%. If the pressure in your car tyres changed by 0.3 %
>
> Would you get your knickers in a twist? I think not.

9. So there is a problem with the scientific basis for Britain to reshape its economy and spend billions in taxes and subsidies to cut emissions of greenhouse gases

> More CO2 means more food as hundreds of studies now confirm.
>
> How lucky can mankind be when at a time of rapidly increasing population (8 billion by 2020) we have an increase in CO2 and thus food

10. All this of course leaves the politicians and their advisor's in a dilemma. They have spent many years and billions of doubloons going down an unjustified path

So what will they now do to convince a very suspicious electorate that is having problems with energy bills, that they know what they are talking about?

Also we have now got UKIP campaigning that these policies are flawed so I await the outcome with interest although I suspect I will have left this earth before this one is played out(damage limitation is the probable political response)

11. I enclose three graphs:

(a) Showing the output from the wind generators over the last year, how can the grid operators possible incorporate such an output into the system?

(b) Plotting three variables against temperature which shows that although mankind is now burning fossil fuels at a monumental rate it is having no effect on temperature

(c) The NASA data plotted against CO2

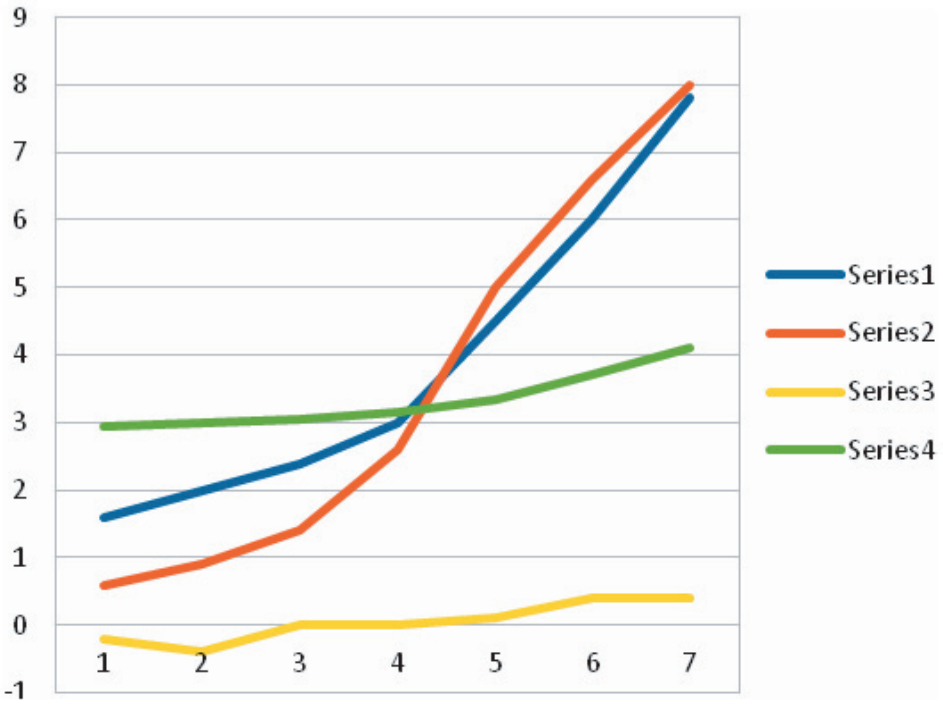
12. As twenty retired NASA scientists have just pronounced" There is no convincing physical evidence existing to support catastrophic climate change forecasts"

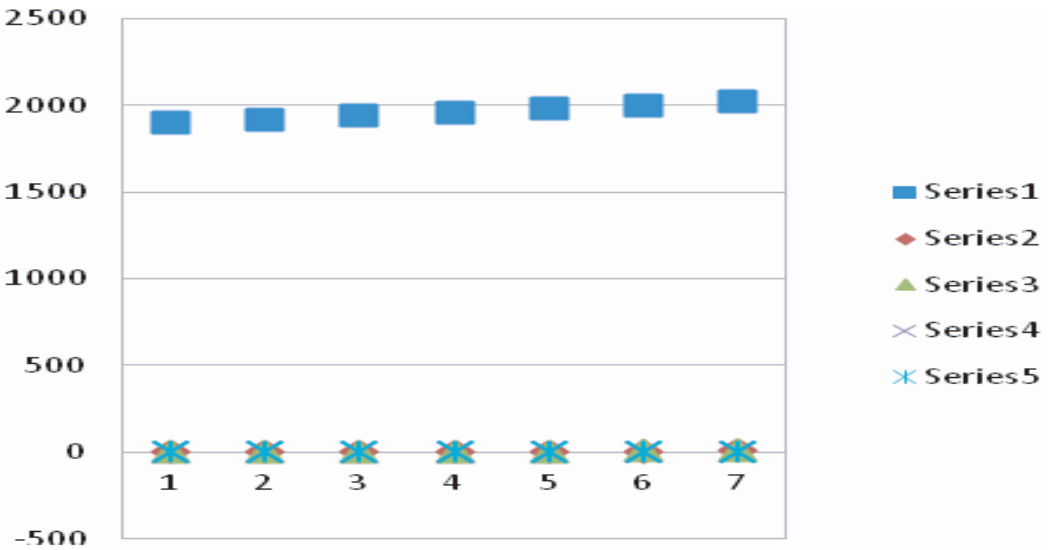
I wish you a good debate

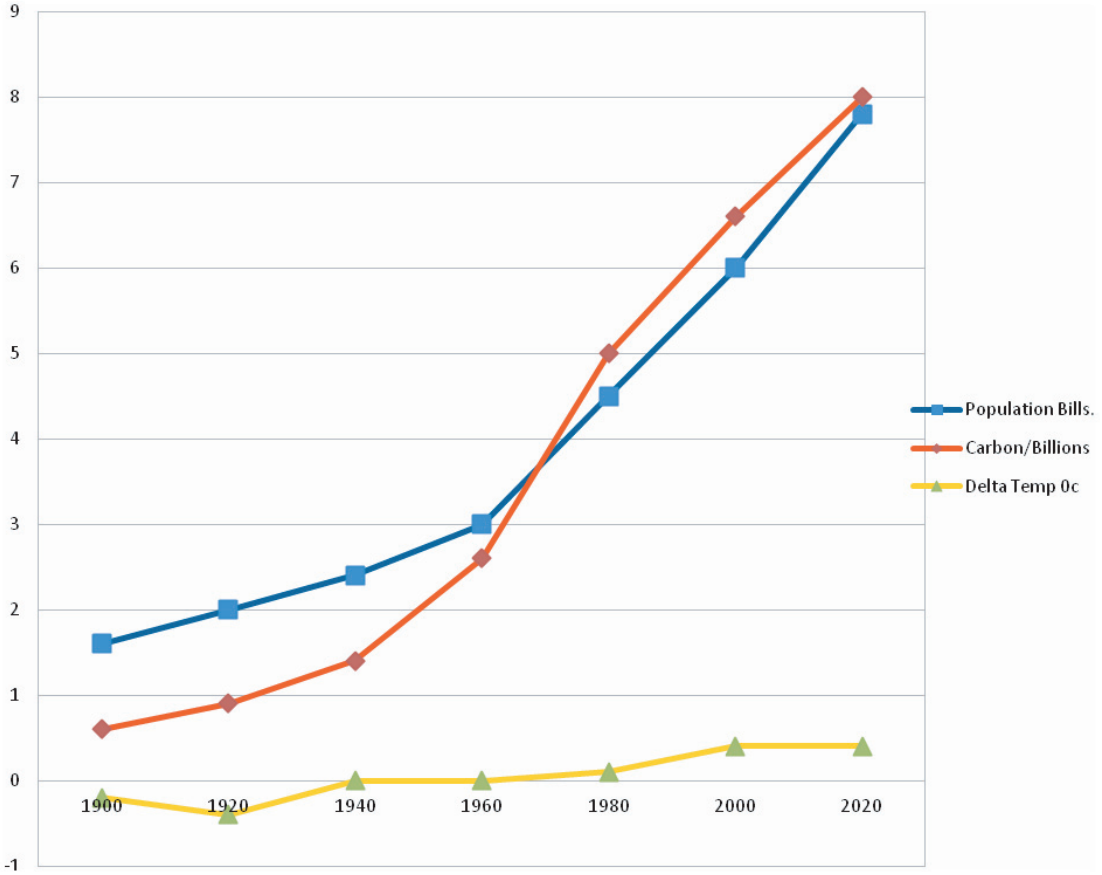
April 2013

Years	*Population Bills.*	*Carbon/Billions*	*Delta Temp 0c*	*CO2/100*
1900	1.6	0.6	-0.2	2.95
1920	2	0.9	-0.4	3
1940	2.4	1.4	0	3.05
1960	3	2.6	0	3.15
1980	4.5	5	0.1	3.35
2000	6	6.6	0.4	3.7
2020	7.8	8	0.4	4.1

World total Use	*Trillions*	*Billions*
For 120 years		
Coal	Tons 1	
Oil	Barrels 2	
Gas	Ft cubed 5000	
Carbon		metric tons 200



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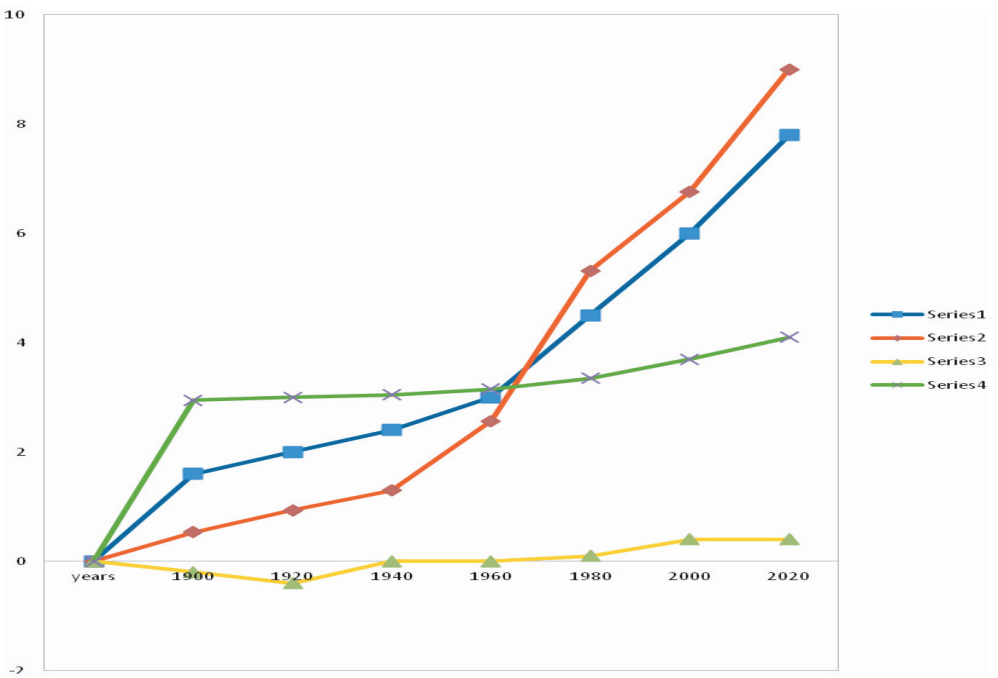
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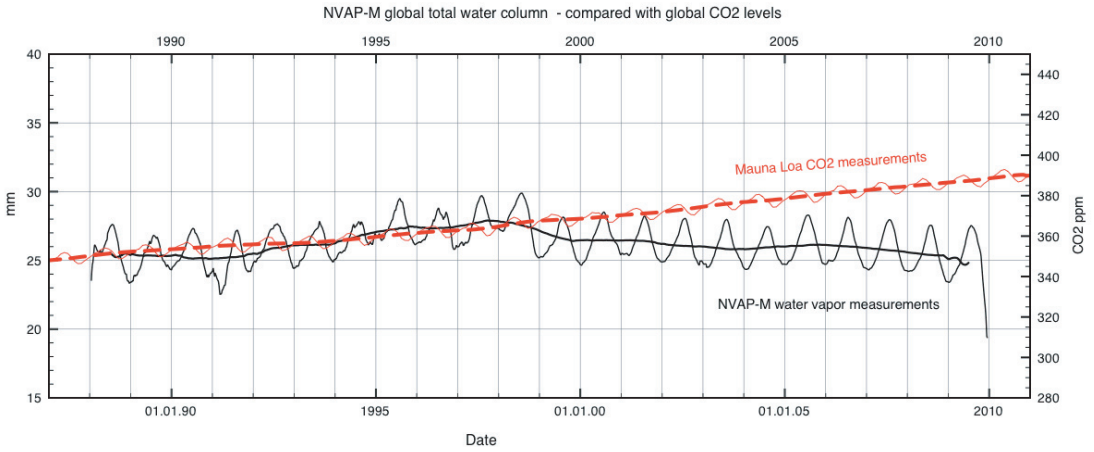


Written evidence submitted by Alex Henney (CLC061)

I studied engineering at the universities of Bristol and Virginia and some economics at the LSE. I was on the board of London Electricity. In February 1987 I was the first person in Britain to propose a competitive restructuring of the electric industry. Following the election of June 1987 I was involved with Secretary of State Cecil Parkinson and civil servants in the early days of restructuring. Subsequently I have worked on electric markets from Norway to New Zealand via North America. I wrote "The British Electric Industry 1990–2010: the rise and demise of competition". My interest in climate science was stimulated by the effect it has had on the British government's belief in anthropogenic climate warming, which has led to very expensive policies for renewables and nuclear power.

"Nullius in verba" (Take nobody's word for it)—The motto of the Royal Society

1. Summary

Two of the questions the Committee asks are "Which voices are trusted in the public discourse on climate science and policy. What role should Government Departments, scientific advisers to Government, and publicly funded scientists have in communicating climate science?" There is unfortunately a fundamental problem in Britain because the official "voices" are all avowedly "warmist" and believe that anthropogenic effects are driving climate warming (ACW), and do not provide a balanced picture of climate science.

1.1 *The distortions of science by the Intergovernmental Panel on Climate Change (IPCC)*

The IPCC is wedded to the view that *"Most of the observed increase in globally averaged temperature since the mid-twentieth century is 90% probable due to the observed increase in anthropogenic greenhouse gas concentrations"*. It is, unfortunately, a politicized body which has endorsed some very dubious and manipulated science in support of this line including:

- The "hockey stick" showing the global temperature declining from 1000 to the beginning of the twentieth century then shooting up, supposedly due to man's emissions of carbon. It was the star of the IPCC's 2001 report, but was subsequently discredited.
- Baseless claims that anthropogenic climate warming (ACW) spreads malaria.
- Its claim (based on a WWF report) that the glaciers in the Himalayas were likely to melt by 2035 had to be withdrawn.
- Baseless claims that ACW has caused extreme weather events.
- The climate models upon which it relies on for many of its analyses are inaccurate. Professor Christy of Alabama University has recently compared the performance of 39 climate model that are being used in the forthcoming Fifth Assessment Report over the period 1975 to 2012 with measured temperature data. The models over back-cast temperature significantly in a range 0–0.7ºC. He is not alone in this finding. As Richard Lindzen, Professor Emeritus of Atmospheric Science at MIT, commented in a presentation to MPs last year "Climate science is immature. It cannot forecast the past, let alone the future".
- Fallacious claims for the quality of work—the IPCC claims that all the contributors are leading scientists "*who are at the top of their profession*" and that the conclusions are based exclusively on peer reviewed papers. Neither claim is true. In the 2007 reports a number of contributors were graduates; 28 out of 44 chapters included at least one individual affiliated with the WWF; 5,587 of 18,531 references were not peer reviewed.

— The character of climate science is not like conventional experimental laboratory science:
  — it is highly politicised and big money hangs on it;
  — much of it is based on trying to make sense of the chaos and complexity of a range of phenomenon. Often correlation is confused with causality; surmise and speculation are mistaken for science; and standards of rigour are low as illustrated by examples given;
  — errors in climate science can persist because the scope for experimentation is limited. A strong emphasis on "peer review" appears to replace the replication of results that is the hallmark of experimental science. Yet the quality of peer review should not be taken too seriously; and
  — modelling is a sub-industry which has developed a life of its own and become an end in its own right, often divorced from empirical reality.
— The "Summaries for Policy Makers" are not scientific but political documents agreed by representatives of member governments. The political conclusion has been known to reflect explicitly back into the Scientific Reports

Given the influence of the Met Office and that the British government has to sign off the Summaries for Policy Makers in Stockholm on 23–26 September, we can expect that the forthcoming IPCC Assessment Reports will be more of the same, regardless of the genuine science.

The IPCC's Scientific Working Group Reports should be treated with extreme caution. While some are scientifically sound, there is some sloppy work and some is politically slanted to meet the IPCC view of ACW and its undesirable consequences. The models claiming to project or predict future climate change are not worth the code they are written in. The Summaries for Policymakers should be treated as politically correct group think and ignored.

1.2 *The Met Office bias*

Starting with John Houghton, its former Chief Executive (1983–91), the Met Office has had, and continues to have, considerable influence on the IPCC reports. Like the IPCC the Met Office is an ardent "warmist". A climate scientist commented of the Met Office's chief *scientist "Julia [Slingo] is an advocate and won't let anything come in or out of her office that doesn't meet the gatekeeping requirements of global warming disaster."* Another scientist commented *"The Met Office is a major employer of scientists and has long had a policy of only appointing and working with those who subscribe to their views on manmade global warming"*.

A set of case examples which I was sent in support of the Met Office's claim that extreme weather events were due to ACW did not substantiate the claim—they were insubstantial. Likewise the current attempt by the Met Office to explain away the "Recent pause in global warming" of 15 years by alleging that the heat resulting from the increase in CO_2 has gone into the deep ocean is thin. The "analysis" is based on string and sealing wax logic along with some dubious scientific claims for knowledge of the behaviour of the oceans; unjustified claims for measurement accuracy; and reliance on inaccurate models rather than empirical data. With no evidence the papers conclude further "The recent pause in global surface temperature rise does not materially alter the risks of substantial warming of the Earth by the end of this century. Nor does it invalidate the fundamental physics of global warming, the scientific basis of climate models and their estimates of climate sensitivity". But before accepting this completely unfounded proposition we should recall that in 2007 the Met Office Hadley Centre stated "We are now using the system to predict changes out to 2014. By the end of this period the global average temperature is expected to have risen by around 0.3°C compared to 2004, and half the years after 2009 are predicted to be hotter than the current record hot year, 1998." In fact temperature remained more or less constant and none of the years have exceeded 1998. As an Arab saying goes "He who professes to foretell the future lies, even if correct"—does the Met Office just merely lie?

1.3 *The "scientific activism" of the Royal Society and of Government Scientific Advisers*

The last three Presidents of the Royal Society and three recent Chief Scientific Advisers to the government have put their names to ACW, although climate science was not their field. I doubt that they would take much notice if atmospheric scientists, oceanographers, and geologists were to advise the public on cosmology, zoology, chemistry, cell biology, and population biology. The Royal Society produced a report "Climate Change: A Summary of the Science" which is a thin and flawed document, overly reliant on IPCC work and computer modelling. The Royal Society and Government Scientific Advisers have ill-advisably indulged in "scientific activism", which is better left to "green" NGOs. They are not living up to the Royal Society's motto.

1.4 *The ignorance of the Secretary of State for Energy and Climate Change/DECC*

In a TV interview Ed Davey, Secretary of State for Energy and Climate Change, made a number of claims that are incorrect, which reflected the pro-ACW scaremongering views of officials in DECC. He could not even get the additional costs of the climate based measures he is enforcing on electric customers correct.

1.5 *The eloquent ignorance of the Chairman of the Committee on Climate Change (CCC)*

The chairman of the CCC recently demonstrated the limits of his knowledge of climate change economics both in a speech in the House of Lords and in an address to the Parliamentary Renewable and Sustainable Energy Group. He in part justified spending money on reducing CO_2 emissions by claiming it was like an insurance policy, and compared it to the rationale for buying fire insurance for one's house. Unfortunately he not only got his numbers wrong, the analogy is false. For all his talk of "science" it is not obvious that John Gummer (who studied history) knows much about climate science beyond some basic temperature information. Although he claims to be open, that seems doubtful given his eloquent ignorance.

1.6 *What can be done to improve public understanding of climate science*

A fundamental point to appreciate is that while there is a vigorous (and often highly politicized) debate in the US between politicians and climate scientists who are both warmists and skeptics, there is no such debate in Britain. Most of the "political class" are supporters of ACW and some who have had an influence on renewables policies have direct financial interests in renewables projects. There are no senior climate scientists who are skeptics in Britain and put his or her head above the parapet, perhaps because they are all on the public payroll and most seek grants which are only awarded to the politically correct. *The consequence of what is effectively the suppression of free debate by "state science" is that we live in parochial little British bubble of supposed scientific consensus.*

There is currently no easy answer to the Committee's questions from such a politicized—and too often factually ill-informed—scene. Perhaps the only hope for an objective review would be to set up a Royal Commission consisting of an independent and balanced group which should not be stuffed with irrelevant scientific great and good. Rather it should be headed by a judge who is noted for rigour and who preferably has a science degree. It should include at most one person from the Met Office; two or three leading North American/ANZAC/Continental European scientists of a skeptical persuasion, and a similar number of British scientists who are preferably not behoven to government grant finding (any such grants should be declared)—none should have been involved in climategate or heavily involved in the IPCC; and either the Rt. Hon. Nigel Lawson or the Rt. Hon. Peter Lilley. It should aim to produce a report of not more than 150 pages of main text written for intelligent lay people. It should focus on solid science, and avoid the politics, spin, and vested interests in which climate science is mired.

2. Introduction

Two of the questions the Committee asks are "Which voices are trusted in the public discourse on climate science and policy. What role should Government Departments, scientific advisers to Government, and publicly funded scientists have in communicating climate science?"

I argue that there is a fundamental problem in Britain because the official "voices" are all avowedly "warmist", and do not provide a balanced picture of climate science, namely:

- The Intergovernmental Panel on Climate Change.
- The Met Office.
- The Royal Society and Government Scientific Advisers.
- The Secretary of State for Energy/DECC.
- The Committee on Climate Change.

3. The Distortions of Science by the Intergovernmental Panel on Climate Change (IPCC)

The IPCC was set up in 1988 under the auspices of the UN Environment Programme and the World Meteorological Organisation. Membership is open to 195 governments (not to scientists per se) which are members of these two organizations. According to the Royal Society "*The IPCC is the world's leading authority on climate change and its impacts*".[74] It has thus far published four Assessment Reports (AR) in 1990 (AR1), 1995 (AR2), 2001 (AR3), and 2007 (AR4) and the firth is due very shortly[75] another is due in September 2013. In AR4 the IPCC stated[76] *"Most of the observed increase in globally averaged temperature since the mid-twentieth century is 90% probable due to the observed increase in anthropogenic greenhouse gas concentrations"*, and claimed that *"For the next two decades a warming of 0.2°-C per decade is projected."* The IPCC also presented in graphic detail the adverse consequences of this warming including an increase in the level of the oceans with extensive flooding; major changes in regional climates with reduction in crops and loss of bio diversity; and various threats to human health.

The IPCC work is shared among three main Working Groups; one assesses the physical scientific aspects of the climate system and climate change; a second assesses the vulnerability of socio-economic and natural systems to climate change; and the third assesses options for mitigating climate change. Ostensibly these are

[74] P295 *et seq*, op. cit., http://www.publications.parliament.uk/pa/ld200506/ldselect/ldeconaf/12/12we24.htm.
[75] Officials are meeting in Stockholm 23–26 September 2013 to sign off the Summaries for Policymakers.
[76] Climate Change 2007: Synthesis report p5 and p7.

scientific reports, which the IPCC has claimed are based on peer reviewed papers by leading scientists. The papers form the basis for the Summaries for Policy Makers which are authorised by governments.

3.1 *The scientific reports*

Some of the scientific observations are measured and cautious such as Chapter 1 of the IPCC 2001 Scientific report (IPCC, 2001a, p.97), which reads:

> *"The fact that the global mean temperature has increased since the late 19th Century and that other trends have been observed does not necessarily mean that an anthropogenic effect on the climate system has been identified. Climate has always varied on all time-scales, so the observed change may be natural."*

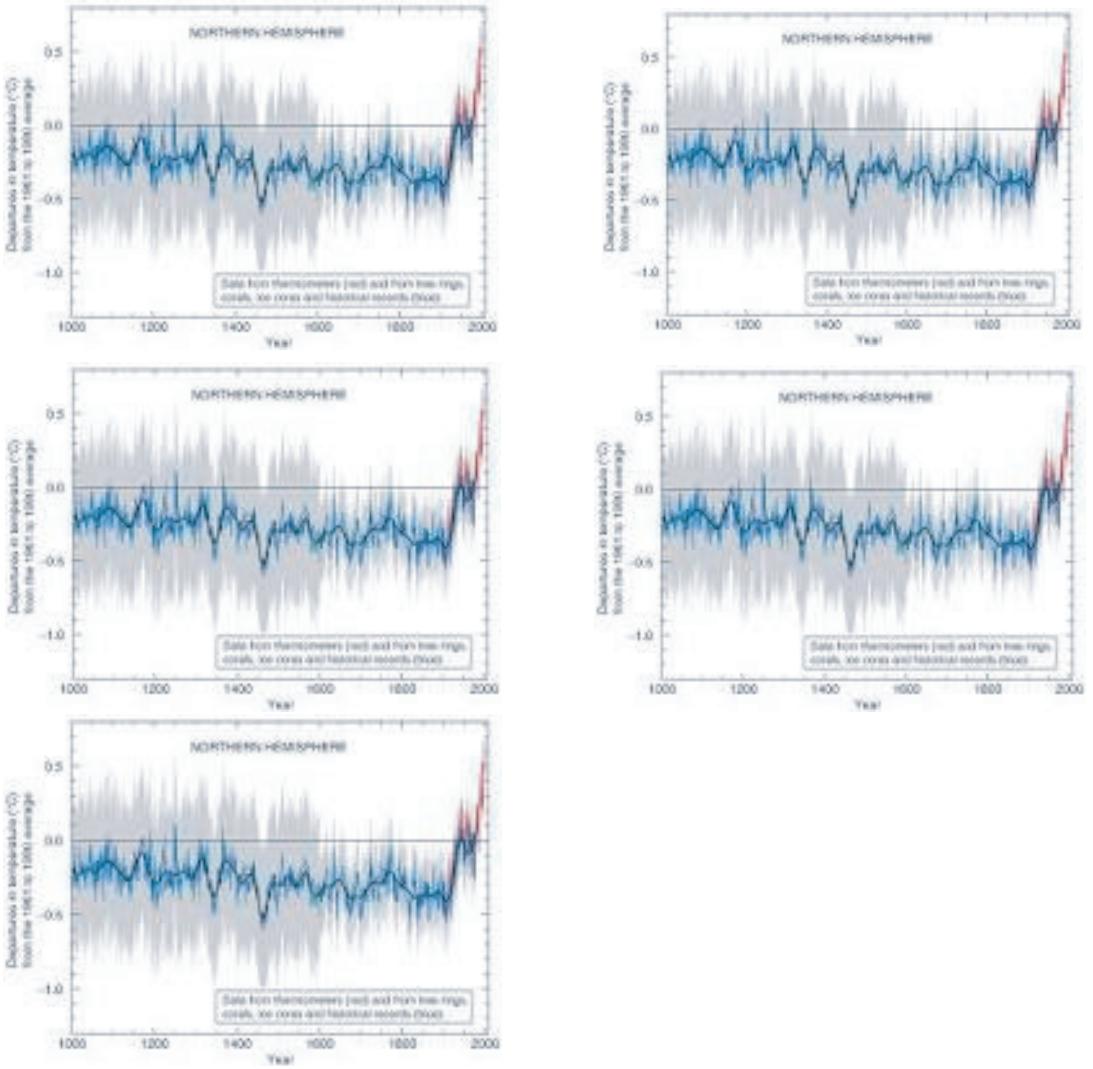
But the IPCC has also endorsed some very dubious and manipulated science as the following examples show.

The cause célebre of the editing of Chapter 8, Detection of Climate Change and Attribution of Causes, in the IPCC's Second AR of 1995. The lead author, American Ben Santer, excised denials of any scientific evidence of anthropogenic climate warming (ACW) which were in the draft, and replaced them with statements to make the Scientific report consistent with the Policymakers' Summary. This claimed that "*The body of statistical evidence in Chapter 8, when examined in the context of our physical understanding of the climate system, now points to a discernible human influence on the global climate*."[77] Perhaps this editing was for the benefit of the position of the Clinton/Gore Administration at the 1997 Kyoto Conference.

The hockey stick was the star of the 2001 report. It was devised by Michael Mann and colleagues and, with the backing of John Houghton (see below), featured prominently in the 2001 Assessment.

[77] In "The Real Global Warming Disaster" (pp62–68) Christopher Booker points out that:
"Santer and colleagues admitted "The changes made after the Madrid meeting were in response to written review comments received in October and November 1995 from governments," as well as from individual scientists and NGOs. The changes were politically necessary to match the IPCC's headline claim to have detected a discernible human influence on global climate, which would have been hard to square with the statement that "no study had shown greenhouse gases." A deputy assistant secretary at the US State Department, Day Mount, wrote to Sir John Houghton, chairman of the IPCC Working Group I, on 15 November: "It is essential…that chapter authors be prevailed upon to modify their text in an appropriate manner following discussion in Madrid."
Booker and North in "Scared to Death" point out "The senior official who gave this instruction worked with Timothy Wirth, the Under-Secretary of State for Global Affairs. He was an ardent advocate of global warming, and a close political ally of Gore."
A 1997 article co-authored by the late Stephen Schneider commented that the Second Assessment Report was "fraught with political significance" because it was published shortly before COP2 in Geneva at which the Clinton administration announced its support for binding emissions targets."

THE IPCC "HOCKEY STICK"



The graph, which was largely based on using tree rings as a proxy temperature measure, showed a slightly decreasing temperature from 1000 to the beginning of the twentieth century, with temperatures then rising rapidly to a peak in 1998 supposedly due to industrialization producing CO_2. It eliminated the Medieval Warming Period, which possibly had higher temperatures than now but significantly less CO_2 and thus spoils the claim that there is a close relationship between temperature and CO_2. And it became the core of the IPCC's claim that *"the 1990s are likely the warmest decade, and 1998 the warmest year, in at least a millennium"*.[78]

Canadians Stephen McIntyre and Ross McKitrick took the hockey stick analysis apart,[79] showing there were many errors in the temperature data and that the algorithm used to analyse the data was biased to produce a hockey stick shape from the type of data that was used. Their criticism was supported from a number of sources and the hockey stick was generally discredited:

— A report by the US National Academies[80] doubted the accuracy of temperatures earlier than 1600, and doubted the claim that the 1990s was the warmest decade for a millennium.

— Two Congressional Committee Chairmen asked Professor Edward Wegman, a leading statistician, and colleagues to examine the statistical methodology used by Mann. They concluded *"In general, we found [Mann's reports] to be somewhat obscure and incomplete and the criticisms of [McIntyre and McKitrick] to be valid and compelling"*.[81]

[78] Significantly nowadays the claim (eg by Secretary of State Davey and the Met Office) is that temperatures have never been warmer than since measured temperatures began about 160 years ago, which is true but of no significance in climate timescales.

[79] Hockey Sticks, principle components, and spurious significance, Stephen McIntyre and Ross McKitrick, Geographical Research Letters (32), 3, 2005.

[80] National Academy of Sciences, National Academy of Engineering, Institute of Medicine, National Research Council, http://www.nap.edu/catalog.php?record_id=11676.

[81] http://www.uoguelph.ca/~rmckitri/research/WegmanReport.pdf.

— Recently Professors McShane and Wyner, using sophisticated statistical techniques concluded[82] *"Predicting historic temperatures based on tree rings, ice cores, and other natural proxies is a difficult endeavor. The relationship between proxies and temperature is weak…Climate scientists have greatly underestimated the uncertainty of proxy-based reconstructions and hence have been overconfident in their models"*.

Professor Paul Reiter is a world leading specialist in the natural history and biology of mosquitoes and the epidemiology of the diseases they transmit. He explained in a submission to the House of Lords Committee on Economic Affairs[83] his experiences with the Human Population Health Chapter of AR2, AR3 and AR4. He commented on the lack of knowledge of many of the contributors, and that the conclusions were derived from distorted scientific knowledge and taken to imply that ACW was spreading malaria and was thus deleterious to health. His experience highlighted a significant lack of scientific competence on the part of the IPCC; a lack of integrity; and show the manner in which science is spun, including the extreme exaggeration that there was a supposed cast of 1,500 (if not more) scientists who signed up to the false conclusions.

"*Himalayagate***":** on 20 January 2010 the IPPC had to withdraw its claim (based on a WWF report) that the glaciers in the Himalayas were likely to melt by 2035.

Extreme weather events: in 1996 the IPCC stated (p173) that "Overall, there is no evidence that extreme weather events, or climate variability, has increased in a global sense, through the 20th century", but subsequently it changed its tune. Based on modeling studies the 2007 Assessment claimed "*that human activities more likely than not have contributed to an increase in tropical cyclone intensity*". Several knowledgeable scientists dispute this:

— Chris Landsea, the Science and Operations Officer at the National Hurricane Centre in Miami, opined *"There are no known scientific studies that show a conclusive link between global warming and hurricane frequency and intensity."* He wrote to the Chairman of the IPCC *"I personally cannot in good faith continue to contribute to a process that I view as not being scientifically sound."* Landsea published "Hurricanes and Global Warming"[84] which comments *"For the United States, current records extending back to 1851 show no trend in either the number of U.S. hurricanes or the number of major U.S. hurricanes…" Regarding the future he commented that the "overall changes that may occur are relatively tiny and are several decades away…"*[85]

— Roger Pielke Jr, an environmental studies professor at the University of Colorado, published a book in which he describes how in the 2007 Assessment the IPCC relied on—but distorted—a paper presented by someone at a workshop he organized on the cost of disasters and climate change[86]. *"The IPCC selectively concluded that "once losses are normalized for exposure, there still remains an underlying rising trend [which is not true]…Even worse, the IPCC included in its supplementary material a graph that plotted temperature alongside disaster losses, smoothing the data and scaling the axes in such a way as to suggest a relationship, despite the fact that none had been shown in the peer-reviewed literature."*[87]

[82] A statistical analysis of multiple temperature proxies: Are reconstructions of surface temperatures over the last 1,000 years reliable?, http://projecteuclid.org/DPubS?service=UI&version=1.0&verb=Display&handle=euclid.aoas/1300715170.

[83] Volume I: Report, HL12-I, 6 July 2005, http://www.publications.parliament.uk/pa/ld200506/ldselect/ldeconaf/12/12i.pdf

[84] http://www.aoml.noaa.gov/hrd/Landsea/gw_hurricanes/.

[85] He checked my script.

[86] Chapter 7 of "The Climate Fix: What Scientists and Politicians Won't Tell You About Global Warming".

[87] He checked my script.

— In a recent submission to a Congressional Subcommittee[88] Professor John Christy of the University of Alabama (who runs one of the two world satellite temperature data sets) reviewed evidence on droughts in the US; extreme high and low temperatures; and record levels of snowfall in 2009–10 and 2010–11. He pointed out "*we were told by the IPCC that "milder winter temperatures will decrease heavy snowstorms. After the winters of 2009–10 and 2010–11, we are told the opposite by advocates of the IPCC position, "Climate Change Makes Major Snowstorms More Likely"*[89]. (No matter what happens the warmists claim evidence of ACW!). He concluded:

> *"From the broad perspective, where we consider all the extremes above, we should see a warning—that the climate system has always had within itself the capability of causing devastating events and these will certainly continue with or without human influence on the climate."*[90]

The claim that we are causing "extreme weather events" will be in the forthcoming Assessment because Professor Julia Slingo, the Chief Scientist at the Met Office, posted a note on the Met Office's website on 3 June 2003 to that effect. When I challenged her for evidence I was sent a set of papers "Exploring Extreme Events of 2011 from a Climate Perspective". It included six case studies of which three did not attribute the phenomenon to ACW, and three did. But they assumed general ACW as a given and two used models as a basis for their analysis of the probability of the event; and the papers that assumed ACW included an author from the Met Office. But as we show below models are not accurate; there was more surmise and "modelitis" than science in the papers; the examples were unconvincing, see Appendix 1.

For warmists the advantage of the proposition that extreme events maybe (or are) a consequence of ACW is that they can proclaim a steady stream of random events as demonstrating ACW, thus maintaining a flow of scare news which the media laps up.[91]

The inaccuracy of climate models: the IPCC publishes what are taken by the media as forecasts[92] of climate warming, notably the figure of 0.2ºC warming per decade, and higher figures of 4–6°C over the twenty first century. But in fact the models are basically flawed; the proof of their pudding is in the eating. Professor Christy has recently compared the temperature predictions of 39 climate models that will be used in the forthcoming AR5 over the period 1975 to 2012 with actual measured data, see exhibit.[93] The black line is the average of the model results; the blue and red circles are the results of two satellite-based actuals; and the green squares are the Met Office surface temperature series. The models over back-cast temperature significantly.

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[88] Written Statement of John R Christy, The University of Alabama in Huntsville, Subcommittee Energy and Power, U.S. House of Representatives, 20 September 2012.

[89] http://www.ucsusa.org/news/press_release/climate-change-makes-snowstormsmore-likely-0506.html.

[90] He checked my script.

[91] Professor Robert Watson, who was chairman of the IPCC 1997–2002, illustrated this phenomenon in a TV programme shown in the Autumn of 2009, when he was interviewed with Professor McKitrich. The programme presented a scene of part of the Amazon which had suffered an unusual drought in 2005, and asked the two men whether this was due to ACW. Shooting immediately from the lip Watson said "yes". Yet he had no basis for his view, which was mere PR for the IPCC's unsubstantiated storyline. McKitrich sensibly said he knew nothing about the facts and could not comment—and showed up Watson.

[92] A leading IPCC scientist, Kenneth Trenbeth, wrote:

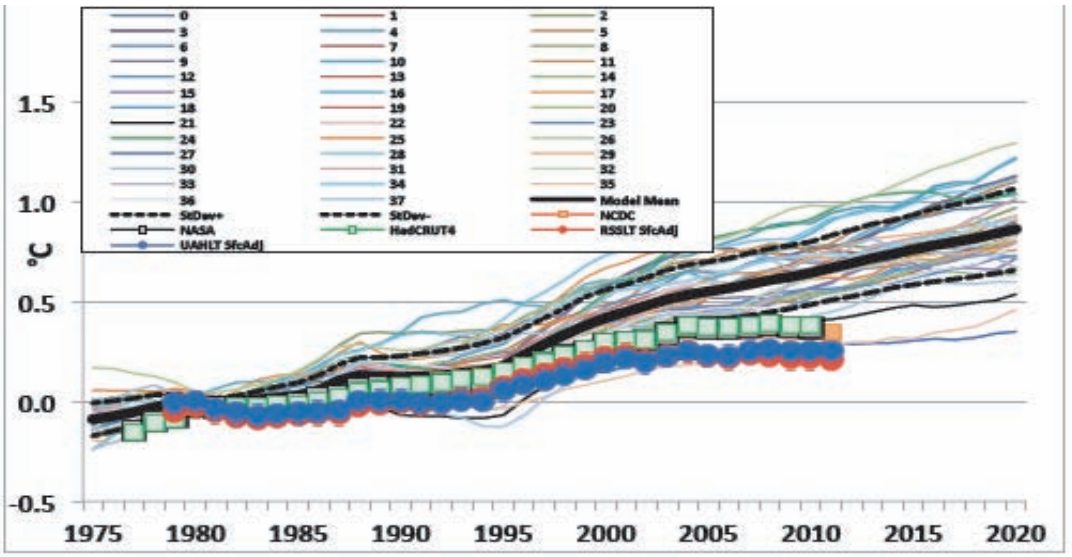
> *"There are no (climate) predictions by the IPCC at all. And there never have been. [Instead, there are only] "what if projections of future climate that correspond to certain emissions scenarios." (Trenbeth, K.E. 2007 Predictions of Climate Change, footnote 178).*

The media is either unaware or ignores this caveat and publishes the scenario projections as predictions or forecasts.

[93] John R Christy, PhD, Alabama State Climatologist, The University of Alabama in Huntsville, House Energy and Power Subcommittee, 20 September 2012, One Page Summary.

Exhibit

GLOBAL CMIP5[94] 39MODELS, SEVEN-YEAR RUNNING AVERAGE



Also recently:

— *Von Storch & Zorita*[95] found that observed temperatures 1998–2012 were not consistent with 23 tested CMIP3 and CMIP5 models, even at the 2% confidence level. The inconsistency increases rapidly with trend length and a 20-year trend (ie to 2017) would lie outside the ensemble of all model-simulated trends. *This paper includes a comprehensive anlaysis of the assumptions underlying models and their shortcomings.*

— *Tung & Zhou*[96] reported that the "underlying net anthropogenic warming rate has been steady since 1910 at 0.07–0.08°C/decade, with superimposed AMO-related ups and downs ..". The sharply increased CO_2 concentrations of recent decades has not caused warming to accelerate, as was predicted by the models.

— *Fyfe Gillett & Zwiers*[97] focused on the extraordinary gap between the temperature simulations of 37 CIMP5 models and the observed outcomes.

A consequence of the underestimation by models has been an underestimate of the natural variability of the climate and an overestimate of anthropogenic climate change:

— *Von Storch & Zorita*[98] conclude that "natural" internal variability and/or external forcing has probably offset the anthropogenic warming during the standstill. Overestimated sensitivity may also have contributed.

— *Yu Kosaka & Shang-Ping Zie*[99] plausibly found that climate models have vastly under-estimated natural variation. La-Nina-like cooling in the Eastern Pacific throughout the 21st century (since the PDO turned negative) has conquered the projected greenhouse warming. The 0.68°C warming trend during 1975–98 (when the PDO was positive) would have been[100] 0.4°C natural and only 0.28°C anthropogenic.

As Richard Lindzen, Professor Emeritus of Atmospheric Science at MIT, commented in a presentation to MPs last year "Climate science is immature. It cannot forecast the past, let alone the future."[101,102]

[94] Coupled Model Intercomparison Group Project Phase 5, which was set up by the World Climate Research Programme to evaluate climate models. CMIP5 is the latest such evaluation for models being used in AR5.

[95] http://www.academia.edu/4210419/Can_climate_models_explain_the_recent_stagnation_in_global

[96] http://www.pnas.org/content/early/2013/01/22/1212471110.short

[97] http://www.nature.com/nclimate/journal/v3/n9/full/nclimate1972.html?WT.ec_id=NCLIMATE-201309

[98] Op.cit.

[99] http://www.nature.com/nature/journal/vaop/ncurrent/full/nature12534.html

[100] http://judithcurry.com/2013/08/28/pause-tied-to-equatorial-pacific-surface-cooling

[101] Global Warming: How to approach the science, Richard S. Lindzen, 22 February 2012.

[102] Lindzen commented of climate models that they "are attempts to solve the relevant equations for motion, energy, composition, etc. using numerical methods with inadequate resolution, where unresolved processes like boundary layer turbulence, convection, clouds, gravity waves, etc. are parameterized. The parameterizations are generally ad hoc devices designed to behave in a manner that is thought to be appropriate where "appropriate" sometimes simply means that the parameterization is designed to compensate for obvious model problems. In addition, fundamental model inputs such as aerosol distributions and properties, solar forcing, and even the radiative forcing by important greenhouse gases are, at best, only approximate, and are sometimes almost completely unknown. In the latter case, they become little more than adjustable parameters." He noted that "current models inadequately account for alternative causes of climate change such as ENSO, the Pacific Decadal Oscillation and the Atlantic", Falsification of climate models used in experimentation and scenario construction, \WIREs Climate Change.

Casual methodology: Canadian journalist Donna Laframboise spent a couple of years examining how the material in AR7 was prepared.[103] She found:

— The claim that all the contributors are leading scientists "*who are at the top of their profession*" is not true. Some are graduates aged twenty something; some are politically correct appointments; and some are there to ensure representation from all parts of the world. She found that 28 out of 44 chapters (two thirds) included at least one individual affiliated with the WWF; 15 out of 44 chapters were led by WWF-affiliated scientists.

— The claim that all papers are peer reviewed is false; she organised a survey of 18,531 references—5,587 were not peer reviewed.[104]

The character of climate science: while it is patently obvious that climate science is highly politicised and big money hangs on it, it is also important to appreciate that it is not like conventional experimental laboratory science. Much of it is based on observing the chaos and complexity of a range of phenomenon and trying to make sense of it. Often correlation is confused with causality; surmise and speculation are mistaken for science; and standards of rigour are low as illustrated by the cases cited above. The case of the Met Office's insubstantial story about extreme weather events, and its "explanation" of the pause in global warming. Both consisted of a mix of surmise, speculation and spin, along with some flawed scientific claims; a reliance on models as though they were real, rather than on empirical data; and reasoning that slithers and slides and includes non-sequiturs. If they are supposed to represent climate "science", then they are no credit to the trade and dismissed; if they are better interpreted as political documents aimed at bolstering the positions of the IPCC and Met Office then they should also be dismissed.

Errors in climate science can persist because the scope for experimentation is limited. An unusual feature is the strong emphasis placed on "peer review", which appears to replace the replication of results that is the hallmark of experimental science. Yet peer review should not be taken too seriously:

— In climate science there can be a relatively small coterie of people reviewing each other's papers—and they peer reviewed the hockey stick.

— The editor of the British Medical Journal performed a trial in which eight errors were inserted into a genuine manuscript, which was then sent out to 420 reviewers. Of the 221 who responded, nobody spotted more than five of the mistakes; the typical reviewer spotted only two; and a sixth of the respondents missed all eight.[105]

Modelling has been thrown into the pot, and has developed a life of its own with models comparing models with each other, but often divorced from empirical reality. Instead of being used as a means to an end of trying to understand processes, they have become a predictive end in their own right.

3.2 *The Summaries for Policy Makers*

Given that the totality of the assessments are voluminous (eg the 2007 Scientific Report was 996 A4 pages and weighed 2.4kg) the critical documents for politicians, their officials, and media are the Summaries for Policy Makers. These are not scientific but political documents as implied by the "intergovernmental" part of the Panel's title.[106] The draft Summaries are largely prepared by the scientific supporters of ACW then crawled over, revised and agreed by representatives of member governments.

The House of Lords Committee on Economic Affairs, which examined "The Economics of Climate Change" in 2005, commented:[107]

> *"governments … do have a say in the Summary for Policy Makers [which is] taken extremely seriously by governments, and it is a line-by-line acceptance…We can see no justification for this procedure. Indeed, it strikes us as opening the way for climate science and economics to be determined, at least in part, by political requirements rather than by the evidence."*

The IPCC's Scientific Working Group Reports should be treated with extreme caution. While some are scientifically sound, there is some sloppy work that does not merit the description of the word "science" and some is politically slanted to meet the IPCC view of ACW and its undesirable consequences. The models claiming to project or predict future climate change are not worth the code they are written in. The Summaries for Policymakers should be treated as politically correct group think and ignored.

[103] "The Delinquent Teenager Who Was Mistaken For The World's Top Climate Expert".

[104] This is at odds with the claim by Professor Julia Slingo before this Committee "that the IPCC, through its process, puts a peer review in place in an area of science that is much greater than any other science ever receives", Qu 198, EV 58, Science and Technology Committee, 1 March 2010.

[105] P377 The Hockey Stick Illusion: Climategate and the Corruption of Science" by Andrew Montford, 2010.

[106] The principles and procedures adopted by the IPCC in June 1993 for the Second Assessment Report stated "Since the IPCC is an intergovernmental body, review of IPCC documents should involve both peer review by experts and review by governments."

[107] Volume I: Report, HL12-I, 6 July 2005, http://www.publications.parliament.uk/pa/ld200506/ldselect/ldeconaf/12/12i.pdf

In short the claims of a body which has promoted some of the specious propositions to which the IPCC has signed up to[108] *should be treated with considerable suspicion. To a degree the IPC promotes "disaster porn", which is consistent with Houghton's view (see below) "unless we announce disasters, no-one will listen."*

4. The Met Office Bias

The Met Office bills itself as "*providing weather and climate change forecasts for the UK and worldwide*", its Chief Scientist, Professor Julia Slingo, assured this Committee in 2010 that "We are world leading."[109] Its influence within the IPCC began with John Houghton, its former Chief Executive (1983–91). He was chairman or co-chairman of the Scientific Assessment Working Group of the IPCC 1988–02 and lead editor of three IPCC reports including that which endorsed the hockey stick. A recent chairman of the Met Office was concurrently Chief Executive of WWF-UK.[110] The influence of the Met Office/Hadley Centre on the IPCC reports continues—Britain is second only to the US in providing authors and review editors to the IPCC and a quarter of them work for the Met Office.

The Met Office produced UK Climate Projections 2009 which purports to project "how the UK climate may change over the 30 year period from 2010–99 at a resolution of 25km." With a possibly Freudian slip it referred to the projections as "predictions". Climatologist R.A. Pielke Sr.[111] commented:

> "This study…is clearly a subversion of the scientific method. To state that climate science is being stretched is quite an understatement. There is absolutely no multi-decadal prediction skill on the spatial scales presented in this study…
>
> *The scientists who present the viewpoint of skillful multi-decadal regional predictions to policymakers are deliberately and dishonestly misinforming the public and policymakers.* (emphasis original)**.**

The proof of the pudding lies in the eating. The Met Office Hadley Centre in 2007 stated "We are now using the system to predict changes out to 2014. By the end of this period the global average temperature is expected to have risen by around 0.3^0C compared to 2004, and half the years after 2009 are predicted to be hotter than the current record hot year, 1998." In fact temperature remained more or less constant and none of the years have exceeded 1998.[112,113] (A wag blogged that the Met Office should rename itself the Climastrology Office).

A current issue the warmists are trying to deal with is the pause in global warming. The Met Office's contribution is a series of three reports on "The recent pause in global warming". The paper starts by claiming that there are two possible reasons for the pause, namely there has either been lower energy from the sun, or the heat has been stored in the deep ocean. This choice specifically excludes the third possibility that the climate is much less sensitive to CO_2 than the IPCC and Met Office have claimed, and the models are useless.

Notwithstanding the inadequacy of the ocean temperature measurements; the inadequacy of models; the lack of understanding of significant characteristics of the Atlantic and Pacific Oceans, the papers conclude with string and sealing wax logic "that the earth system has continued to absorb a substantial amount of heat during the last 15 years, despite the pause in surface wearing" (p15)." "Heat is most likely taken up by the ocean below 800m (p17)." With no evidence the papers conclude further "The recent pause in global surface temperature rise does not materially alter the risks of substantial warming of the Earth by the end of this century. Nor does it invalidate the fundamental physics of global warming, the scientific basis of climate models and their estimates of climate sensitivity" (p3). (In view of its lamentable record of seasonal and climate forecasts perhaps the Met Office should reflect on the Arab saying "He who professes to foretell the future lies, even when correct"—does the Met Office just merely lie?) Appendix 2 shows the papers and includes not only unjustifiable leaps of logic and non-sequiturs and claims for the validity of models that just do not stack up, but also some of what Professor Judith Curry[114] regards as dubious science.

A recent article in the Spectator[115] claims that:

> "Last November, the Labour peer Lord Donoughue tabled a written question asking whether the government considered the 0.8C rise in the average global temperature since 1880 to be "statistically significant". Yes, came the reply. Douglas J. Keenan, a mathematician and former trader for Morgan Stanley, knew the answer was false. With Keenan's help, Donoughue tabled a follow-up question. The Met Office refused to answer it, not once, but five times. Its refusal to clarify its stance left the

[108] When the IPCC collected the Nobel peace prize with Senator Al Gore it notably did not disassociate itself from the climate fictions he peddled in "An inconvenient truth". In 2007 Mr. Justice Burton in London identified nine factual errors in the video and commented that "the video was used to make a political statement and to support a political programme".

[109] Qu 197, EV 58, Science and Technology Committee, 1 March 2010.

[110] Robert Napier, chairman of the Met Office from October 2006–2012, which overlapped with the period when he was Chief Executive of WWF-UK from 1999–2007, WWF Press Release of 20/7/2006.

[111] Senior Research Scientist, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado in Boulder, and Professor Emeritus of the Department of Atmospheric Science, Colorado State University, Fort Collins.

[112] How Good Are Met Office Predictions, Werner Brazeck, Watts Up With That? 14 July 2013.

[113] To rub salt into the wound in 2009 the Met Office predicted a "barbecue summer"—it was a washout; in 2010 a "milder than average winter" just before one of the coldest on record; in 2012 "a drier than average spring and early summer" followed by one of the wettest summers on record.

[114] Chairwoman of the School of Earth and Atmospheric Sciences at Georgia Tech.

[115] Forecast failure: how the Met Office lost touch with reality, Rupert Darwall, 13 July 2013, http://www.spectator.co.uk/features/8959941/whats-wrong-with-the-met-office/.

energy minister, Baroness Verma, in an awkward position. Only then did it confirm that it had no basis for the claim."

A foreign scientist, who has significant knowledge of the Met Office, observed of the set of papers that I was sent about extreme events (see above) "This is a non-response. Julia is an advocate and won't let anything come in or out of her office that doesn't meet the gatekeeping requirements of global warming disaster." Rupert Darwall[116] quotes an anonymous scientist commented *"The Met Office is a major employer of scientists and has long had a policy of only appointing and working with those who subscribe to their views on manmade global warming"*, which is clearly an effective way to get a "consensus"!

5. The "Scientific Activism" of The Royal Society and of Government Scientific Advisers

The last three Presidents of the Royal Society—Robert May, a theoretical physicist and zoologist; Martin Rees, a cosmologist and astro-physicist; Paul Nurse, a geneticist and cell biologist—and three recent Chief Scientific Advisers to the government—the same Robert May; chemist David King (who absurdly suggested that by the end of the 21st century "*Antarctica was likely to be the only habitable continent left on earth*"); and John Beddington, an expert in population biology—have put their names to ACW, although climate science was not their field. (One imagines they would not have taken too much notice if oceanographers, atmospheric scientists, or geologists had advised the public on their specialisms).

The Royal Society's report "Climate Change: A Summary of the Science" is a thin and flawed document signed off by a raft of scientists, few of whom are climate scientists. It relies heavily on climate models, among other things claiming "Current understanding of the physics (and increasingly the chemistry and biology) of the climate system is represented in a mathematical form in climate models, which are used to simulate past climate and provide projections of possible future climate change." It also claims that "Climate models indicate that the overall climate sensitivity (for a hypothetical doubling of CO_2 in the atmosphere) is likely to lie in the range 2C to 4.5C." Both of these claims are baseless. The document refers to:-

- "Increases in average sea level"—in fact the average rise in sea level in the twentieth century was around 1.5mm p.a. and according to the IPCC "no significant acceleration in the rate of rise during the twentieth century had been detected".
- "There has been an overall decline in the area covered by sea-ice floating on the Arctic Ocean over the past 30 years (although there has been a small increase in the area covered by sea-ice around Antarctica)." In fact the total of Arctic and Antarctic ice is running close to the average since 1980; the Arctic is somewhat low, but within historic variability.
- It puts considerable weight on claims by the IPCC, which as pointed out above is not a reliable source of science.

The Royal Society and Government Scientific Advisers have ill-advisedly indulged in "scientific activism" which is better left to "green" NGOs. They are not living up to the Royal Society's motto "Nullius in verba".

6. The Ignorance of the Secretary of State for Energy and Climate Change/DECC

On 14 July Andrew Neil interviewed Ed Davey, Secretary of State for Energy and Climate Change, on Sunday Politics on the BBC. Davey made a number of claims that are incorrect, namely:

- He claimed the "physics is settled". It is not; among other things there is an ongoing debate about whether (because of the little understood behaviour of the clouds and water vapour) there is positive or negative feedback from an increase of CO_2, which has a critical effect on prospective warming from CO_2.
- CO_2 and temperature—Davey referred to a correlation between level of CO_2 and temperature. In fact over a range of timescales the increase in CO_2 has *lagged* an increase in temperature.
- He claimed the temperature of the ocean has been increasing, which is not true for the nine years of observations of the new Argo network of 3,000 more accurate buoys launched in 2003.
- He claimed the ocean level is rising at an unusual rate, which is not true see above.
- He claimed the ice caps are melting, see above.
- He claimed there has been an increase in extreme weather events, and referred to British farmers and droughts and flooding. These claims are baseless.

Davey could not even get the additional costs of the measures he is enforcing on electric customers correct, claiming "the vast majority [of the cost] is making people's homes warmer—only a small amount is spent subsidizing renewable and low carbon energy". Let us help him—according to DECC figures the policies he is espousing have already increased average electricity bills by £80 p.a. (out of a total bill of £563) of which £22 is spent on energy companies' energy efficiency obligations and £50 on subsidies. The £80 figure is

[116] The Age of Global Warming: A History, 2013.

forecast to increase by an additional £200 by 2020, a tax to be paid out of post-tax incomes[117]. By the early 2020s the annual costs of Davey's ambitions will total £10–11 billion for subsidies, capacity payments, and additional transmission on an industry with a turnover of about £30 billion[118]—surely something is going to give some time?

7. The Eloquent Ignorance of the Chairman of the Committee on Climate Change (CCC)

The main role of the CCC is to prepare carbon budgets and report on progress in meeting them. Although the Committee takes ACW as a given and does not major on the issue, it has a few misleading quotations from the IPCC on its website. More significant is the speech in the House of Lords on 18 June 2013 by its chairman, former Conservative Secretary of State for the Environment John Gummer, and his address to the Annual Conference of the Parliamentary Renewable and Sustainable Energy Group on 10 July 2013.

In the Lords he commented:[119]

> "There is no doubt that there is sufficient scientific belief and evidence that climate change is happening, is caused by human beings and could be disastrous. It is therefore a threat with which we have to deal. There are two ways that you can deal with a threat: the first is to insure yourself against it, and the other is to hope for the best."
>
> "The chance of disastrous climate change occurring is enormously greater than the chance of your house burning down, yet we are now seeking to say that we should not spend certain sums. At the moment, for an average family the cost is about £60 a year and by the end of 2020 it will be £100 a year."

In his conference speech he compared this cost with the average cost of home insurance against fire of £140 p.a. when the probability of a fire is 0.2%. "I am asking for less than half for an event which is not 0.2% probable but 98% certain." There are three problems with the insurance storyline:

- His figures are wrong. The DECC figure for the cost of environmental/climate measures for 2020 is £286—and that figure assumes a significant reduction in consumption, which is a political aspiration.
- The means of reducing CO_2 emissions with windmills is not effective in a thermal based electric system as in Britain.[120]
- House fire insurance is not an appropriate analogy for climate insurance. If I insure my house and it burns down, I get paid. If I pay "climate insurance" and others (eg in China, India, Indonesia etc) do not pay theirs, then I have no insurance.[121]

In order to seem scientifically reasonable Gummer claimed "We are the skeptics in the sense that we look at the science clearly and skeptically, and we come to a conclusion based on the science and we revisit it every time some new science comes our way…but it would be foolish to ignore the very large consensus." However for all his talk of "science" it is not obvious that Gummer (who studied history) knows much about climate science beyond some basic temperature information. Although he claims to be open, that seems doubtful given his eloquent ignorance.

8. What can be done to Improve Public Understanding of Climate Science

A fundamental point to appreciate is that while there is a vigorous (and often highly politicized) debate in the US between politicians and climate scientists illustrated by the recent report by a Senate Committee

[117] DECC's estimate of the costs of environmental measures to 2020:

	£ *p.a.*
EU ETS + carbon price floor tax	67
RO support cost for windmills	63
Electric Market Reform	47
Feed in tariffs	22
Smart meters	6 (understated)
	205
Eco support costs	66
Warm home discount	15
	81

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/172923/130326_-_Price_and_Bill_Impacts_Report_Final.pdf, 27 March 2013.

[118] pp12, 13 Annex E, Consultation on the Draft Electricity Market Reform Delivery Plan, July 2013, DECC.

[119] Column 157 *et seq.*

[120] A study of the Irish system for which the system operator publishes the CO2 emissions every 15 minutes found that when the pumped storage system was being refurbished and the balancing of the variability of the wind was undertaken by CCGTs the effectiveness of CO2 mitigation plummeted; with 12% wind production the mitigation was only 4%. The reason is that cycling the CCGTs reduces their thermal efficiency and so increases their CO2 emissions, see "Wind—Whitehall's pointless profligacy", Alex Henney and Fred Udo, in New Power Issue 45, October 2012. Joseph Wheatley found the same effect "Quantifying CO2 savings from wind power: Ireland".

[121] Britain emits 2% of the world's greenhouse gases. Although we may virtually eliminate the 30 Mtoe of coal we used in power plants in 2012, between 2001–09 the use of coal in China and India increased by 967Mtoe and is forecast to increase by a further 3300TWh p.a. by 2035, which is about 30 times the current output of Britain's coal plants (109TWh in 2011). As Peter Lilley MP pointed out in a recent speech in Westminster Hall, the increase in China's CO2 emissions in 2011 was 200Mt more than the total emitted by the UK.

"Critical Thinking on Climate Change",[122] there is no such debate in Britain. Apart from Nigel Lawson and Peter Lilley most of the "political class" are on side. Gummer is chairman of the Committee on Climate Change and former chairman of the London Array; former Minister Charles Hendry is chairman of a wind company; and the former chairman of the Energy & Climate Change Committee Tim Yeo collects a substantial sum from renewables companies and is the President of The Renewable Energy Association. There are no senior climate scientists who are skeptics in Britain and put his or her head above the parapet perhaps because they are all on the public payroll,[123] seek grants and many have mortgages to pay and families to keep, and so they are politically correct. Also many have invested their careers and "face" in the position they espouse. *The consequence of what is effectively the suppression of free debate by "state science" is that we live in a parochial little British bubble of supposed scientific consensus.* In view of the influence of the Met Office on the IPCC scientific reports and that the British government has to sign off the Summaries for Policy Makers, we can be confident that the forthcoming Assessment will continue the same storylines, but will now include an explanation of the reason why the temperature has not increased over the last 15 years which the Met Office has just trailed.[124]

There is currently no easy answer to the Committee's question from such a politicized—and too often—factually ill-informed environment. Given the long history I have observed from both within and without the civil service of the British government talking superficial nonsense and spinning on a range of matters, I do not believe any statement from the government and its agencies that I cannot independently check. If the aim of the Committee is to improve the knowledge of the public about climate science, then:

- It should recommend a free distribution by DECC to all MPs with Kindles or equivalent of "Taxing Air: Facts and Fallacies about Climate Change",[125] which is available from Amazon for £3.84
- A Royal Commission should set up consisting of an independent and balanced group. It should not be stuffed with irrelevant scientific great and good who may well come out with the typical Whitehall whitewash. Rather it should be headed by a judge who is noted for rigour and who preferably has a science degree. It should include at most one person from the Met Office; three or four leading North American/ANZAC/Continental European scientists of a skeptical persuasion or open minded, and a similar number of British scientists who are preferably not behoven to government grant finding (any such grants should be declared)—none should have been involved in climategate or heavily involved in the IPCC; and either the Rt. Hon. Nigel Lawson or the Rt. Hon. Peter Lilley. It should aim to produce a report of not more than 150 pages of main text written for intelligent lay people. It should focus on solid science, and avoid the politics, spin, and vested interests in which climate science is mired

September 2013

APPENDIX 1

THE CLAIM BY THE MET OFFICE THAT EXTREME WEATHER EVENTS ARE INCREASING

Professor Julia Slingo put a claim on the Met Office's website on 3 June to the effect that extreme weather events were increasing due to ACW. In reply to a request for substantiation I was sent "Explaining extreme events of 2011 from a Climate Perspective", which consisted of a series of papers.[126] The introduction quoted a 2012 paper by the IPCC:[127]

> *"It is likely that anthropogenic influences have led to warming of extreme daily minimum and maximum temperatures at the global scale" and that "there is medium confidence that anthropogenic influences have been contributed to intensification of extreme precipitation at the global scale."*

Reference to that document found:

> *"Many extreme weather and climate events continue to be the result of natural climate variability… Observed changes in climate extremes reflect the influence of anthropogenic climate change in addition to natural climate variability, with changes in exposure and vulnerability influenced by both climatic and on-climatic factors."*

Regrettably there was no hard edged evidence to support the latter part of the proposition.

The introduction also included a reference to a paper which claimed of the very hot European summer of 2003 "The demonstration that human factors had influenced the climate of southern Europe in a quantifiable way over the latter part of the twentieth century was an important element in establishing that human influence has probably substantially increased the likelihood of an extreme warm summer like that experienced in the

[122] Critical Thinking on Climate Change, Minority Report, US Senate, Environment and Public Works Committee, 18 July 2013, http://www.epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=f4ace657–9490–4f4c-86f3–25d367e2085c.

[123] See Andrew Montford's response to Q130, 27 July 2013, with which I agree. In my work I have drawn on North American and ANZAC scientists as no British scientist has anything to say that criticizes the supposed consensus.

[124] The recent pause in global warming (1), (2), (3), Met Office, July 2013.

[125] Written by a group of Australians led by Professor Bob Carter and cartoonist John Spooner, July 2013.

[126] Thomas C Peterson, Peter A Stott and Stephanie Herring, Editors, American Meteorological Society, July 2012, http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/2011-peterson-et-al.pdf.

[127] IPCC 2012, Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C B *et al*], a special report of Working Groups I and II of the IPCC.

region in 2003". But this claim was based on an analysis of a model simulating the low probability of the event occurring. Then followed six papers describing various extreme events. The first discussed "The absence of a role for climate change in the 2011 Thailand Floods", while the second described how warming in the Indian Ocean had contributed to more frequent droughts in Eastern Africa, but it did not attribute the ocean warming to ACW, and cautiously commented "It is impossible to unambiguously attribute a single event to anthropogenic climate change". Another paper by French climate scientists discussed the "Contribution of atmospheric circulation to remarkable European temperatures of 2011". It pointed out that the temperature pattern was very unusual, but again it did not mention ACW. This left three papers:

3. [128]"Did human influence on climate make the 2012 Texas drought more probable" by American and British climate scientists including one from the Met Office. The paper started by stating that the 1960s to 2012 was "a period during which there has been a significant anthropogenic influence on climate" before attempting to attribute the Texas drought of 2011 to ACW. But at least the paper concluded "Hence, while we can provide evidence that the risk of hot and dry conditions has increased, we cannot say that the 2011 Texas drought and heat wave was "extremely unlikely" (in any absolute sense) to have occurred before this recent warming". (Note this paper is directly at odds with a submission to a Congressional Subcommittee by Professor John Christy[129]).
5. "Have the odds of warm November temperatures and of cold December temperatures in central England changed?" by British academics and two from the Met Office. The paper started by claiming:

   > "The emergent science of probabilistic event attribution is becoming an increasingly important method of evaluating the extent of how this human-influenced climate change is affecting localized weather events."
   >
   > "We use large ensembles of the two climate scenarios to evaluate whether the frequency of warm Novembers and cold Decembers occurring has altered between the 1960s and 2000s, this being the period during which there has been a significant anthropogenic influence on climate."

6. "Lengthened odds of the cold UK winter of 2011 attributable to human influence" by two Met Office scientists. The paper used models to calculate the probabilities of the cold winter and concluded "Model results indicate that human influence has reduced the odds by at least 20% and possibly by as much as 4 times with a best estimate that the odds have been halved". The paper concludes:

   > "The winter of 2010–11 was a rare weather event, even in the context of the 352 years of the central England temperature record. Yet while the odds of such an event have lengthened as a result of human influence on climate, such unlikely events can still happen."

It is interesting to note that the advocates of warming were trying to have it both ways. One of the last three papers and the reference to the European heatwave were claiming ACW was increasing summer temperatures, while two were claiming ACW was decreasing winter temperature—they do not like to lose!

The paper on the European heatwave of 2003 and papers 4, 5 and 6 all included Met Office staff. They derive the probability of occurrence of an extreme event by comparing it with modelled climate behaviour. But we saw from the main script that climate models (including the Met Office model which is in the centre of the pack in the exhibit) do not project or forecast climate accurately. The papers' reliant on them can be dismissed; models are models, not science which is about facts. *In reality this was a very thin collection of papers with more surmise and speculation and "modelitis" than science; they did not substantiate Professor Slingo's contention.*

APPENDIX 2

THE MET OFFICE ATTEMPTS TO RATIONALIZE THE PAUSE IN TEMPERATURE RISE

The Papers

In July 2013 the Met Office published a sequence of three reports on "The recent pause in global warming" which purport to answer the questions (1) what do observations of the climate system tell us?; (2) what are the potential causes?; and (3) what are the implications for projections of future warming?[130] The attempt at explanation starts with a selective proposition, namely "There are potentially two distinct mechanisms to explain the recent pause; the first involves changes to the total energy received by the planet (radiative forcing), and the second involves the low frequency variability of the oceans and the way in which the oceans take up heat and store it below the surface, potentially into the deeper ocean." This specifically excludes the third possibility that the climate is much less sensitive to CO_2 than the IPCC and Met Office have claimed, and the models are useless.

The storyline of the papers starts with the claim that we can conclude little from the temperature pause because "it is only with averaging periods of 30 years or longer that climate change can be detected robustly"

[128] The numbers refer to the sequence in which they were presented.
[129] Written Statement of John R Christy, The University of Alabama in Huntsville, Subcommittee Energy and Power, U.S. House of Representatives, 20 September 2012.
[130] http://www.metoffice.gov.uk/research/news/recent-pause-in-warming.

(p6). *But if this is the case why has so much been made of the twenty years of warming from 1980 or so to 2000 or so?*

The explanation of the "pause" has been "through redistribution of energy within the climate system, particularly through exchange between the upper and deep ocean, which can temporarily hide the warming beneath the surface" (p7). (But the Pacific Decadal Oscillation "may have played a substantial role in the recent pause in the global surface temperature rise" (p12)).

At one point the report claims that "The Argo measurements indicate a rapid increase in heat content down to 700 million between 1999 and 2004" (p14). But in reality Argo floats[131] only began to be installed in 2000 and all 3,000 were not in place until 2007, and then time should be allowed to collect and analyse data. While the Argo floats were being installed, there was a mix of historically collected and Argo data which was not consistent. The Met Office admitted (p15) "Although Argo floats are increasingly providing robust global measurements of the upper ocean, drawing conclusions from periods during which there are large changes in an observing system must be treated with caution." This reservation did not, however, temper its enthusiasm for concluding "that the earth system has continued to absorb a substantial amount of heat during the last 15 years, despite the pause in surface wearing" (p15)." "Heat is most likely taken up by the ocean below 800m (p17)."

With no evidence the papers conclude further "The recent pause in global surface temperature rise does not materially alter the risks of substantial warming of the Earth by the end of this century. Nor does it invalidate the fundamental physics of global warming, the scientific basis of climate models and their estimates of climate sensitivity" (p3).

Blogs

Two scientists have written significant blogs on the Met Office papers "The recent Pause in Global Warming". Professor Judith Curry of Georgia Tech on her blog judithcurry.com on 23 July, and Bob Tisdale who describes himself as an independent climate scientist on his blog bobtisdale.wordpress.com on 25 July when he commented on Part 1 and on 30 July when he commented on Part 2. His blogs include extensive graphical evidence. An anonymous blog comment on Curry's blog by HR summarises well the fabrications of the Met Office's story.

Curry[132]

In Paper 1 a 15+ yr pause seems to be reflected in the surface temperature, lower tropospheri temperature, lower stratospheric temperature, NH hemisphere snow extent, and total column water vapor. Nonetheless the concluding remarks claim *"It has shown that a wide range of observed climate indicators continue to show changes that are consistent with a globally warming world, and our understanding of how the climate system works." AH comments:* hardly consistent.

Paper 2 asks *"Is the current pause in global warming unusual?"* and comments:

> "It is clear that there have been other periods with little or no surface warming in the relatively recent past, a good example being the period between the 1940s and the 1970s (Figure 1). The trend in warming over that period is well understood, and linked to a substantial increase in the amount of aerosol in the atmosphere."

JC comment: The 1940s to 1970s pause is not well understood…The aerosol explanation doesn't hold up.[133] I suspect it has mostly the same cause as the current pause, associated with changes in the ocean circulation patterns, notably the Pacific Decadal Oscillation (PDO) and Atlantic Multi-decadal Oscillation (AMO).

> "However, prior to 1965 and from 2000 to the present day, there are substantial differences between the net radiative flux and the upper ocean heat uptake (black dashed curve in Figure 9), implying heat taken up by other components of the climate system, most likely the ocean below 800m…" (*AH comment:* this is pure surmise).
>
> "If, however, the observations are robust, then the maximum in upper ocean heat uptake in the early part of this decade and the subsequent minimum in upper ocean heat uptake cannot be explained by changes in net radiative fluxes, as shown by large residuals in Figure 10. This suggests that the pause in global surface warming is unlikely to have been caused solely by systematic changes in the top of the atmosphere radiation associated with solar variability and minor volcanic eruptions, anthropogenic aerosol emissions, or changes in stratospheric water vapour as suggested in other studies."

JC comment: this acknowledgment that not all climate change is forced is important; unfortunately they only seem to apply it to the recent pause and not the warming in the 1980′s and 1990's.

[131] Argo floats are free drifting floats that repeatedly sink down to 2000m and rise up, measuring temperature, salinity and velocity of the upper ocean.

[132] http://judithcurry.com/2013/07/23/uk-met-office-on-the-pause/

[133] The Met Office contradicts itself noting that:
"What drives these multi-decadal variations in the North Atlantic temperatures is still unclear and there is a debate about the role of anthropogenic aerosols in forcing the AMO (Booth et al 2012, Zhang et al 2013)."

> "In addition, direct measurements of the exchange of heat between the upper and deep ocean do not exist because the present ocean observing network does not sample the ocean below 2000 million adequately."

JC comment: This acknowledges the deficiencies and uncertainties in magnitude anyways of the recent deep ocean heat uptake.

> "What can we conclude from all this? First, periods of slowing down and pauses in surface warming are not unusual in the instrumental temperature record. Second, climate model simulations suggest that we can expect such a period of a decade or more to occur at least twice%ury, due to internal variability alone. Third, recent research suggests that ocean heat re-arrangements, with a contribution from changes in top of the atmosphere radiation, could be important for explaining the recent pause in global surface warming."

JC comment: They seem to think that this pause is not unusual or even unexpected. 16 years of "pause" and counting brings us very close to falling completely outside of the large envelope of climate model simulations. You can see why they want to redefine the pause to begin in 2000.

> "The scientific questions posed by the current pause in global surface warming require us to understand in much greater detail the flows of energy into, out of, and around the Earth system. Current observations are not detailed enough or of long enough duration to provide definitive answers on the causes of the recent pause…"

AH comments: this does not stop the Met Office strongly insinuating that it definitely knows the answers!

Paper 3 concludes "the recent pause in global surface temperature rise does not invalidate climate models or their estimates of climate sensitivity. It does however raise some important questions about how well we understand and observe the energy budget of the climate system, particularly the important role of the oceans in taking up and redistributing heat, as highlighted in the second report…"

JC comment: They dismiss all of the recent empirical estimates of low climate sensitivity, and continue to think climate models are adequate.

Tisdale

He notes in his response to Part 2[134] "What they (ie the Met Office (MO)) fail to acknowledge is that sea level is a terrible proxy for global temperatures. In looking at the global temperature plots in the top panel of their Figure 1, global surface temperatures cooled from 1880 to about 1917 and then warmed from 1917 to 1944. As if repeating a cycle, global surface temperatures then cooled from about 1944 to 1976 and warmed once again from 1976 to 1998–2000. But the rise in sea level did not slow during the two cooling period…In short, based on the 30-year trends, there is no agreement between the rates as which global surface temperatures warm or cool and the rates at which global sea level rises. So there is no reason based on past cooling periods since 1880 to believe that the rise in sea levels would slow during the recent hiatus in global warming…Global sea level has risen since the end of the last ice age, and based on data presented by the MO, the rate at which it has risen during the instrument record has no relationship with the rate at which global temperatures have warmed or cooled.

He cites a recent paper that discusses the many faults with climate model simulations of the Atlantic Multidecadal Oscillation, The Atlantic Multidecadal Oscillation in twentieth century climate simulations: uneven progress from CMIP3 to CMIP5, Ruiz-Barradas et al, 2013.[135] The beginning of the "Concluding remarks" observes (all subsequent emboldening is Tisdale's):

> *Decadal variability in the climate system from the AMO is one of the major sources of variability at this temporal scale that climate models must aim to properly incorporate because its surface climate impact on the neighboring continents…If climate models do not incorporate the mechanisms associated to the generation of the AMO (or any other source of decadal variability like the PDO) and in turn incorporate or enhance variability at other frequencies, then the models ability to simulate and predict at decadal time scales will be compromised and so the way they transmit this variability to the surface climate affecting human societies.*

The authors then describe the many problems with climate model simulations of the Atlantic Multidecadal Oscillation and end observing:

> *The current analysis does not provide evidence on why the models perform in the way they do but suggests that that the spurious increase in high 10–20 year variability from CMIP3 to CMIP5 models may be behind the unsatisfying progress in depicting the spatiotemporal features of the AMO. This problem, coupled with the inability of the models to perturb the regional low-level circulation, the driver of moisture fluxes, seem to be at the center of the poor representation of the hydroclimate impact of the AMO.*

[134] http://bobtisdale.wordpress.com/2013/07/30/part-2-comments-on-the-ukmo-report-the-recent-pause-in-global-warming/
[135] http://link.springer.com/article/10.1007/s00382–013–1810–0

If climate modelers cannot simulate the AMO properly, then it's very obvious that the pause in global surface temperatures from the 1940s to the 1970s is not "well understood"…as the MO claims. Then the MO makes the admission that "*The characteristics and mechanisms for the PDO are less well understood than for the AMO.*"

Based on the MO's own statements, they and the climate science community in general do not understand the causes of the multidecadal variations in the sea surface temperatures of the Atlantic and Pacific Oceans. This indicates that they also do not understand what caused the global warming from the mid-1970s to about 2000. If they can't explain the pause, then they surely can't explain the warming.

The MO states with unbelievable certainty:

> *In summary, observations of ocean heat content and of sea-level rise suggest that the Earth system has continued to absorb heat energy over the past 15 years, and that this additional heat has been absorbed in the ocean.*

But they've presented nothing to support their certainty.

A blog comment by HR | *July 25, 2013 at 8:43 pm.*[136]

This all really exposes the just so nature of some of climate science. We have internal variability which is poorly understood mechanistically and poorly quantified. Aerosols that again aren't fully understood mechanistically and badly observed. As well as other forcings and feedback. Each one is wheeled out at different times to explain unexpected observations and at other times are completely forgotten when the aim is to tell a clear story about GHGs. So we seem to have:

1. 1910–40 that warmed more rapidly than expected from forcing. As Ed Hawkins on his blog commented it could be solar, lack of volcanoes, internal variability or GHGs.
2. 1940–70 that didn't warm fast enough, maybe it's aerosols, maybe not.
3. 1970s-end of 1990's. Certainty that it was GHGs. At least no other mechanism needs to be evoked to explain things.
4. 2000ish-present a pause that might be aerosol, climate variability, something else or a mixture of any.

The really horrible part is the certainty of 3) amidst so much unknown. We seemingly have poorly observed, poorly understood and poorly quantified processes that can at least be as large as the GHG forcing (given they seem to be fully masking the ongoing GHG forcing in present Pause). Yet we can have what seems to be highly level of certainty about attributing warming at the end of the 20th century.

It just horrifies me. Either I'm seriously missing something in climate science or this is all just badly observed, badly controlled and badly understood best guessing.

Written evidence submitted by David Fogarty (CLC0062)

The following is a submission to the UK Parliament's Select Committee on "Climate: public understanding and its policy implications". I am writing this in my personal capacity as a specialist science and environment writer. I was the climate change correspondent for Thomson Reuters in Asia (2008–13) and I'm now a media consultant and writer focusing on environmental issues. I started writing about climate change in the late 1980s. The following comments are for the public record.

SUMMARY

— Climate change media coverage has declined in many major media outlets right at a time of growing concern over wilder weather, energy costs and political paralysis in taking bold steps. The public needs clearer support for climate science from governments and better grassroots engagement to stem the feeling of alienation in the debate on tackling climate change.

— The media is a major tool in educating the public about climate change but declining coverage and expertise has led to narratives being largely negative and sensationalised and, in some cases, vulnerable to non-credible sceptical voices.

— The media should go back to basics and do rigorous assessment of climate change sceptics and energy, mining and chemicals sector lobbyists.

— Reporting on climate change should be no more difficult or specialised than other media beats but cut backs, sceptical editors, apathy and misunderstanding the reach of climate change impacts have hampered reporting.

— Media, and government, need to focus on positive narratives of ways to adapt to climate change in terms of economic shifts and lifestyle shifts and focus on the positive nature of the discoveries about how the planet works that come from climate research.

— Not everything has to be couched in climate change terms. Sometimes it's best just to sell the message about energy and fuel efficiency, for instance, as good economic sense and making the best use of finite resources.

[136] http://judithcurry.com/2013/07/23/uk-met-office-on-the-pause/#comment-351839

Q: *Are there particular difficulties when reporting complex science areas such as climate science?*

A specialist climate science/climate change reporter should have no more difficulty covering their beat than other specialist correspondents. Climate science is complex but no more so than, for instance, mergers and acquisitions, specialist criminal or business law or international trade. Reporters should have a background that allows them to understand the technical details of the main issues of their beat; be able to quickly distinguish what is new and therefore news and what isn't; have credible contacts who can offer insight on developments and offer contrasting opinions to help readers better understand any key developments.

1. The difficulties come from several areas. Specifically for climate science: A) Editors who have a personal bias against the subject matter and pressure the specialist reporter to include non-credible sceptical voices in the guise of offering balancing opinions. B) Sub-editors with little or no knowledge of climate science who try to cut back or rewrite the story, changing the meaning or introducing errors. Or worse, simply deciding to spike a story because they can't see the relevance. C) Budget cut backs that mean the reporter can't travel to specialist climate conferences to meet contacts (or make new ones). D) Senior editors and/or sub-editors who can only see climate change through the lens of polarised debates, such as climate sceptics vs climate scientists, or at the political level, such as rows over carbon pricing schemes and the costs on voters and industries.
2. These embittered debates often overshadow the real and ongoing developments in climate science—developments that add depth to our understanding of the issue and which can help policy-makers and companies better plan ahead for the impacts of climate change. Of late, the increase in severe weather has, to some extent, pushed aside the polarised debates in the minds of the public and focused on climate change impacts and adaptation measures. But the narrative is often still one of doom and gloom which, in an era of hardship in many major economies, tends to turn people off climate change. They have enough problems in their lives and I think many people feel helpless about climate change.
3. While not a new idea, there needs to be more effort in showing the public how they can individually respond to climate change, that there are small, collective and positive steps that can be taken, such as energy efficiency measures. This then provides a base to build community involvement and better education about climate change.
4. Fraught U.N. climate talks have also not helped the climate change narrative. There is also less focus on positive solutions and positive actions already taking place, such as renewable energy investment, energy efficiency, fighting deforestation through zero-deforestation supply chains and efforts to get companies to value nature, to name a few areas. A lot of reporters, pushed by editors who want a tabloidy approach, still go for the doom-and-gloom and scandal stories, perpetuating the cycle and turning off readers.

Q: *What makes climate stories interesting and publishable?*

5. The number one reason I feel climate science is interesting is because it helps us better understand how the planet works. Climate change scientists are pushing the boundaries in terms of understanding how the atmosphere works, how the oceans work and the interactions between the land, oceans and atmosphere. Despite the incredible advances in understanding climate change science, scientists are repeatedly finding gaps in our understanding of these natural interactions and how loading up the atmosphere with greenhouse gases can affect the way the planet operates, often with unclear consequences.

6. In short, there is still so much more to learn and climate change science is an ongoing process of discovery about our planet. For instance, the warming of the Arctic and the impact on the Jetstream winds, affecting winter weather in the Northern Hemisphere. This process is still a major area of investigation. Or the reasons for the so-called pause in global warming and the increase in deep ocean heat levels. When will this heat be returned to the atmosphere and at what rate and what is the influence of huge ocean gyres and La Nina episodes in the cooling and transfer of heat to the deep ocean?

7. Climate change science is also about opportunity and adapting. How can we build economies that are less polluting, more efficient, profitable and less wasteful? We can. Economies are continuously evolving. With the right amount of consumer pressure, supportive government policies and voter buy-in, economies can adapt. There is plenty of scope here for deeper narratives. Just as there is scope for deeper dives into exposing exactly how powerful business-as-usual groups are funding mis-information about climate change for their own ends and manipulating the media. The public can and should understand this process. Doing so will reveal who are the trusted sources of information and validators of climate science—and who isn't.

8. At Reuters I tried to take climate change reporting in a new direction, away from the doom and gloom, looking at the science as it evolves, how climate change will affect businesses, food and agriculture and communities and what can and is being done in terms of responding.

Q: *Has there been a loss of scientific and environmental expertise in newspapers and news agencies? What has been the impact of this for the coverage of climate science?*

9. Among major news outlets, yes. This has happened in part because of staffing and funding cuts across many news outlets but also because of the misperception that climate change was no longer a big news story—not helped by the confusing and disappointing outcome of the Copenhagen climate conference but also because of deep economic woes in many major economies. In some cases, there has been a clear ideological shift, where one or more senior editors are sceptical about climate change, hampering climate change coverage and allocation of resources. And in some cases, I believe there is a fundamental misunderstanding about the reach of climate change.

10. I think some editors still view it as a slow-moving train crash but fail to see climate change touches every facet of an economy, from energy production and use, urban planning, tourism, food production, building design, to the insurance sector. These are rich areas to explore for reporters because businesses in all these sectors are increasingly aware of the risks of climate change (and poorly designed climate policies) and want more information.

11. It should be noted that, particularly in the United States, a number of specialised climate change reporting news outlets have emerged, somewhat filling the void created by the major news outlets cutting back. These include http://www.climatecentral.org/, http://www.climatenewsnetwork.net/ and the more specialised investigative http://insideclimatenews.org/ . But none of these has the reach or readership of major media outlets. That said, it is clear The Guardian has proved to be an exception, devoting sizeable resources to climate and environment and earning wide play with their stories.

12. Overall, the cutbacks have had a negative impact in a number of ways. Fewer specialist climate reporters means reduced coverage of major climate meetings and major climate science findings (such as those published in scientific journals) or junior or less experienced reporters are assigned to cover these, often struggling to understand the subject matter.

13. In turn, with less specialist coverage (or none if the media outlet has re-assigned or made the post redundant), media outlets have little or no in-house resources for climate change knowledge and little or no ability to make good news judgement calls. This leaves editors vulnerable in terms of assessing the value of climate stories and/or trends and vulnerable to a vocal minority of sceptical voices trying to sow doubt. It also leaves media outlets less prepared to respond to a major climate change-linked event, such as coverage of a major government or U.N. report, or how to accurately report on a weather disaster and to carefully frame this in a climate change context.

14. Overall, there has been a dumbing down of climate change coverage into some pretty clichéd themes. That does not serve an anxious and often confused public. Most people want to know how to respond to the threat of climate change and they look to governments, trusted academics, top-level NGOs and the media to explain things in an unbiased way. People are anxious about what is happening now with the weather and they want to know what is likely to happen in the future and how they are likely to be affected. They also want to know the costs and the solutions. Businesses do, too.

15. In many ways, the public is caught in the middle. Powerful business-as-usual interests are trying to delay climate action by creating confusion over the science and creating doubt in the minds of policy-makers (or just buying them off), while climate scientists are besieged by a vocal minority that are given undue amounts of airplay. Reporters need to go back to basics and look at the quality of the sources of sceptical information. Who are these people? What are their credentials and background? Are their views to be trusted or are they simply lobbyists?

16. Governments should continue to support credible, peer-reviewed scientific work on climate change and promote this work to the public. The public needs to know who they can trust and sometimes the public needs a little guidance on this. They also need to understand there are clear reasons for action when it comes to formulating policy, such as energy and transport policies.

Q: *Has there been a change in climate science and policy news coverage in the UK recent years? If so why do you think this is? How effective is the press in the UK at distinguishing legitimate concerns about climate and energy policies and less accurate criticisms of the science?*

17. I can't answer these questions directly in the context of the UK. But by way of comparison, as an Australian, I can give you a very brief overview of what's been occurring in Australia where, as in Britain and the United States, there has been a fall in the number of specialist environment and climate reporters at major media outlets. The Murdoch press has unashamedly led the way in promoting sceptical and largely inaccurate views on climate change and carbon pricing. There has been too little effort, in my view, by the federal government and other media, to directly challenge the views of the Murdoch press (particularly The Australian newspaper) to counter the rise in public scepticism of climate change. A sceptical political Opposition (now the new government) has also greatly hindered public education on climate change and the impacts on Australia and the need to respond (ironically so despite the large number of extreme weather disasters in recent years from droughts, wildfires, epic floods and storms).

18. The media response in Australia has been mixed, largely failing to really challenge the climate policies of the Opposition. Instead, many reporters have allowed themselves to be trapped by the poisonous political row over carbon pricing and the impacts on the economy and jobs. The public has been left confused and ultimately turned off by the endless political bickering and misinformation by powerful business lobby groups and sceptical media outlets. In short, the climate change debate in Australia has been hijacked by petty politics and a largely ineffectual media more keen to satisfy tabloid tastes than to truly challenge and expose the shallowness of the debate.

19. By way of some defence, the Labor government did try to educate the public and support climate change science and scientists through several means, including the creation of the Climate Change Commission, a respected grouping of scientists which has published regular non-technical reports on extreme weather, the causes and impacts, as part of its brief to explain climate change science to a lay audience. Their efforts are to be applauded and they have been pretty effective in getting media attention and educating the media by and large.

20. Another positive development is the creation of alternative media outlets, such as Crikey.com.au (subscription based) and The Conversation, in which academics tackle climate change and other pressing issues in an unbiased and sometimes hard-hitting manner. So at least Australians do have access to quality reporting and writing on climate and environment if they look outside mainstream media.

Q: *Do you have a view on the reasons James Painter found in his research that the UK and US press represent 80% of sceptical voices in the countries he included in his study?*

21. My view is that is not surprising. Many of the world's top energy and mining firms are based in these countries (plus Australia and Canada). What's interesting is the low level of climate change scepticism in Asia. I live in Singapore and I hardly come across sceptical views here in the media, if at all. Similarly so in Indonesia. Both countries accept climate change as a fact and as a threat and have policies or goals aimed at addressing it in myriad ways. In Singapore's case, it is energy efficiency, restrictions on transport emissions, long-term planning in terms of raising sea wall height for new reclamations, addressing coastal erosion and test-bedding electric vehicles. The government is also actively researching likely rainfall and temperature scenarios going forward and constantly trying to improve drainage to cope with more extreme flooding. This level of action (plus a compliant media) reinforces in the minds of residents that climate change is something that is real, is a threat and can be responded to with effective policies.

22. As a final point. While it seems obvious, a well-informed public is critical in terms of crafting and winning acceptance of climate policies. Media play a major role here as educators and as conduits of (ideally) unbiased, balanced information. Policy-makers in government are more likely to respond to the clear wishes of voters than muddled views. It is a fair expectation of the media to report on major issues, such as climate change, with all due resources and with all due care. If they don't, they should be called to account by government and the paying public.

23. And not everything has to be couched in climate change terms. Sometimes it's best just to sell the message about energy and fuel efficiency, for instance, as something that makes good economic sense and makes the best use of finite resources.

September 2013

Written evidence submitted by Dr Richard Lawson (CLC0063)

Written evidence submitted by Dr Richard Lawson, a retired General Practitioner of medicine and Green Party activist (one of the first Greens to be elected to a local authority), author of Bills of Health (Radcliffe 1996), on the impact of political and economic conditions on NHS spending. I have been debating climate science with climate sceptics on the web over the past four years.

SUMMARY

- The public is turned off by the complex nature of the climate debate, and the seemingly irreconcilable differences of "experts".
- However, a little-recognised consensus has emerged between both sides, namely:
  - The Greenhouse Effect exists, and CO_2 is a greenhouse gas
  - Doubling CO_2 levels will produce a global temperature increase (eventually, when equilibrium is re-established) of about 1.2°C.
  - Climate Sensitivity (CS) means that this increase will be amplified.
  - Mainstream climatologists hold that CS means that a doubling of CO_2 will cause an eventual temperature of 2–4°.
- "Lukewarmer" sceptics believe that the eventual temperature lies between 1°C and 2°C.
- There is therefore a common figure of 2°C, and it will be productive to discuss whether this figure would be tolerable for humanity or not.

A Polarised Debate

It is well known that the debate over anthropogenic climate change is deeply polarised. At the extreme of the side that rejects the scientific consensus are a group who are implacably opposed to accepting any part of mainstream climate science. Every point of science, whether it be the greenhouse effect, the physics of CO_2, or the possibility that we could decarbonise the economy, is vehemently contested, and no coherent case is put forward for an integrated view of the planet's energy budget. These "sceptics" believe that climatology has been almost universally corrupted by a political conspiracy whose aim is to raise taxes for the sake of raising taxes, destroy Western capitalism and usher in a totalitarian New World Order.

It is pointless to debate with these people, just as it is pointless to debate with a creationist.

However, over the past few years there has emerged a group of climate sceptics called Lukewarmers. They do accept a large part of the scientific basis of climatology, but they believe that the effect of greenhouse gas emissions will be minor rather than catastrophic. Lukewarmers have penetrated into the political establishment in the UK, and occupy more than one position of authority in the present Government.

A Consensus Figure

Lukewarmers accept that the Greenhouse Effect exists, and that CO_2 is a greenhouse gas. They accept that a doubling of CO_2 will produce a global temperature increase (eventually, when equilibrium is re-established) in the vicinity of 1°C. They accept that Climate Sensitivity (CS) means that this increase will be amplified to some extent, but believe that the eventual equilibrium temperature for a doubling will lie between 1° and 2°C.

Mainstream climatologists on the other hand believe that CS means that a doubling of CO_2 will cause an eventual temperature rise of 2–4°.

There is therefore a common temperature increase of two degrees Centigrade which both sides of the debate agree is a possible outcome. The figure lies at the top end of the range of that accepted by sceptics, and at the lowest end of the range accepted by climatologists, but nevertheless, it is accepted as possible by both sides.

How Consensus Modifies the Debate

Major changes flow from the insight that 2 degrees is accepted by both sides. The debate becomes simplified and comprehensible to the person of average intelligence. Instead of ranging across the whole immensely complex field of earth systems, it focuses on these three major points:

1. Scientific evidence on climate sensitivity.
2. The nature of feedback mechanisms, their sense and magnitude.
3. The changes in biodiversity, climate, weather, economics and politics that might reasonably be expected as a result of an increase of 2°C over pre-industrial levels.

Furthermore, in terms of scientific method, a classic Popperian refutation becomes possible. The lukewarmers are putting forward a testable hypothesis, that anthropogenic greenhouse gases have a minor effect. This hypothesis can be tested, both in terms of whether their evidence for low sensitivity is robust, and also whether their estimates of the effects of a 2°C temperature rise, which they accept is possible, can in fact be classed as trivial and tolerable.

The emerging scientific discipline of "Attribution" becomes relevant here. If it is possible to attribute extreme weather events to anthropogenic changes at the present level of warming (0.7°C), it becomes very clear that an increase of 2°C could not be regarded as trivial.

This testability of the lukewarmers sceptics' case gives us the opportunity to conclude the first phase of the climate debate, regarding the seriousness of the effects of CO_2, so that we can move forward to determining and implementing the best policies for decarbonising the global economy.

Recommendations

1. The STC should suggest that the Government's Chief Scientist should prepare a report reviewing the evidence regarding CS, and another reviewing the impact of a 2°C temperature rise.

2. The Science and Technology Committee should put the points made here about the game-changing nature of the consensus CS figure of 2°C into its report.

3. The STC should persuade DECC and other relevant sections of Government to take on board the line of reasoning presented in this paper.

September 2013

Written evidence submitted by At-Bristol science centre (CL0065)

1. Introduction

At-Bristol is an award winning science and discovery centre based on Bristol's historic harbourside, and a landmark Millennium project. At-Bristol is a member of the national Association of Science and Discovery Centres UK (ASDC).

We are submitting evidence to this select committee as we strongly believe that At-Bristol, and other science and discovery centres in the our national network, are playing and can continue to play a significant role in engaging the wider public with climate change.

2. Context

At-Bristol's vision is to "make science accessible to all". We welcome over 200,000 visitors annually, working with diverse audiences including families, schools, teachers and community groups. The science centre is host to over 200 interactive exhibits, allowing visitors to have hands-on experiences with science, technology, engineering and maths. Changing learning programmes, including science shows, workshops, experiments, competitions, lectures and special events are tailored to specific audience interests and needs.

3. Experience

Since opening in 2000, At-Bristol has used core funds, grants and sponsorship to successfully engage the public with emerging "science and society" topics and issues, such as nanotechnology, synthetic biology and climate science. Some examples include:

Schools audience:

- Time for Nano—EU funded nanotechnology engagement project www.timefornano.eu .
- Citizen science—secondary schools' science and citizenship resources and programmes.
- Green schools revolution (Co-operative funded).
- Climate Science Outreach Project (with the Science Museum, London).
- A Question of Taste—Polymerase Chain Reaction lab workshop with supporting DNA debate about the ethical and moral questions raised by PCR application.

Public audience:

- Sciencewise-ERC—adult dialogue and consultation event on the feed-in tariff.
- Decide project—deliberative process game around science and society issues (eg xenotransplantation, pre-implantation genetic diagnosis, stem cell research) now widely used throughout Europe www.playdecide.eu .
- Inside DNA—UK touring exhibition investigating DNA and genomics www.insidedna.org.uk .
- "The future of Genomics" adult lecture with Sir John Sulston FRS.
- "Synthetic biology: hope and hype" discussion event with the Synthetic Components Network.

Supporting public engagement and science research:

- Public engagement training for the Synthetic Components Network (synthetic biology) researchers.
- Embedding Dialogue and debate—national training programme of "Dialogue Academies" to develop science dialogue and facilitation skills within science centres www.dialogueacademies.org.uk .

4. Science and discovery centres such as At-Bristol are ideal venues for bringing science research and the public together, for investigation and dialogue.

Over the last two years, At-Bristol has undertaken a significant programme of energy reduction and sustainability activity. We have won multiple awards, from food procurement standards, to carbon and energy reduction. Achievements include:

- 12% energy reduction in 12 months—Cutting CO2 emissions by 107 tonnes.
- GOLD Green Tourism Award.
- West of England Carbon Challenge Carbon Champion Award.
- 10:10 Campaign Success Story.
- A case study for the Green Tourism Business Scheme, West of England Carbon Challenge and 10:10.
- Winner of a Silver South West Sustainable Tourism Award 2011.

We use the technology and systems of the science centre building (eg 50 kW peak Photovoltaic array, green roof, eutectic tank heat exchange system, advanced energy monitoring) to bring the science of sustainability to life, to act as a "living case study" and provide positive and engaging examples of success.

By leading the way as an exemplar centre of positive change for energy reduction, we provide an exciting and trusted informal learning environment, and a fantastic springboard for climate science discussion and debate.

5. At-Bristol and similar centres for informal learning and public engagement with science should be seriously considered as agents in successfully engaging the public with climate science and research. This activity is already underway in many centres. We offer:

- inspiring and "neutral" environments for learning;
- significant experience in engaging the public with challenging and emerging science;
- significant experience of bringing science research and the public together (including public engagement training for researchers);
- passionate, professional science communicators, with expertise in dialogue and facilitation;
- large public footfall, and established databases of specific audiences, and existing relationship with key audiences; and
- a shared passion for developing a scientifically literate and engaged UK population.

At-Bristol would welcome any further opportunities arising from this Select Committee enquiry

October 2013

Written evidence submitted by Professor Steve Jones (CLC0067)

In evidence given to your Committee's inquiry on climate science, the BBC Head of Editorial Standard's, David Jordan said that the BBC "…had decided not to follow Jones' key recommendations on climate change: '[Jones] made one recommendation that we did not take on board. He said we should regard climate science as settled … we should not hear from dissenting voices on the science.'"

While writing my Report to the BBC Trust on science coverage I was in general impressed by the breadth, depth and balance of the Corporation's treatment of the subject, and have been equally so by its rapid and effective responses to many of the suggestions I made (that of the dangers of "false balance" included). My report was, though, greeted with some disagreement by respected commentators:

> *Daily Mail (Melanie Phillips):* "… wickedly cynical propaganda to promote a false belief".
>
> *Sunday Times (Nigel Lawson):* "… characterised chiefly by ignorance and intolerance".
>
> *Daily Express (David Rose)* "… seems to want BBC coverage to be subject to quasi-Stalinistic thought policing".
>
> *Daily Telegraph (Christopher Booker)* "… the astonishing claim that the only problem with the coverage of climate change was not that it was too biased, but that it was not biased enough".
>
> *Daily Telegraph (James Delingpole)* "… a sustained and brilliant rebuttal to the threadbare notion that our state broadcaster is in any way capable of being fair and balanced".

A similar but less immoderate statement was made more recently in *The Guardian* by Peter Preston: "2,000 climatologists signing pieces of paper don't automatically convert a doubting public. … I'm an urgent believer in doing something about global warming. But I also live in a democracy. And nothing is QED".

In spite of such claims, I emphatically did not say that "we should regard climate science as settled … we should not hear from dissenting voices on the science". What I did in fact say in the BBC Trust report was:

> "For science … there is a wide acceptance of a body of scrutinised fact, interrupted by rare moments when ideas change. Constantly to call in external voices unwilling to accept that principle is not to engage in debate but in meaningless polemic. … Attempts to give a place to anyone, however unqualified, who claims interest can make for false balance: to free publicity for marginal opinions and not to impartiality, but its opposite. … There should be no attempt to give equal weight to opinion and to evidence."

The producers of the recent *Today Programme* piece on the new IPCC report tried, we are told, more than a dozen qualified climate scientists willing to give an opposing view but could not find a single one (a hint, perhaps, that there is indeed a scientific consensus on global warming). Instead, they gave equal time to a well-known expert and to Australian retired geologist with no background in the field: in my view a classic of "false balance".

Having said that, I reiterate that in my view BBC science coverage is good and getting better, that the Corporation responded quickly and effectively to most of my recommendations and that the balance problem is now less severe than it was. Indeed, it now seems to be more or less confined to news reporting about climate change. Why the BBC remains so obsessed with contrarian views on this subject I do not know.

October 2013

Written evidence submitted by the UK Association for Science and Discovery Centres (CLC069)

I write in response to the discussion during the oral evidence session on 9 October 2013 within the inquiry "Climate: Public understanding and policy implications". My points relate to the Members' discussion around the need for trusted mechanisms (a portal) to engage the public with climate science, and if such a mechanism existed. I believe it does, and I outline below the nature of this trusted portal which currently engages 20 million people every year in both cities and rural locations across the UK.

The UK Association for Science and Discovery Centres brings together over 60 of the UK's major science engagement organisations, including science and discovery centres, national science museums, environment centres and learned societies. Together, these trusted centres attract over 20 million visitors each year who take time to explore and delve into science in a hands-on, intriguing and personal way. The Association's centres span all regions and countries of the UK and reach into a huge number of "hard to reach" communities. They collectively engage over two million school students from a range of socio-economic backgrounds, who take part in science workshops, discussions, labs and science events.

The subjects covered by the science and discovery centres range from climate science to space science and from nanoscience to brain science. However, it is clear to all professionals working within the field of science engagement that there is no greater immediate need, nor indeed any greater challenge, than to engage people effectively and widely on the subject of climate science—and to do this very soon.

The UK Association for Science and Discovery Centres, with its vibrant and trusted national infrastructure and thousands of professional science engagement specialists could play a major role in helping people in all parts of the UK to engage with the latest climate science, and get people talking about the UK's policy response.

These lively science centres already operate successfully and sustainably in this engagement sphere; they are embedded in their local communities with excellent relationships with university science, industrial partners, schools, teachers and families. Indeed, the work they currently do is valued highly enough by families, schools, teachers and the wider public that in most cities,[137] people pay to visit, and visit repeatedly.

Science and Discovery Centres are experts in both engagement, and in science. Indeed, it is their raison d'être and their charitable mission. They are staffed by talented creative individuals with considerable expertise in all areas of the sciences, as well as communications, design, education, marketing, the arts and more.

The majority of ASDC member centres (from At-Bristol to the Eden Project, and from W5 in Belfast to the Science Museum in London) have already invested significantly in programmes and exhibitions to engage their publics with climate science. These range from lively evening events for adults, workshops for schools, family shows and carbon competitions right through to full hands-on climate exhibitions and formal dialogue events in partnership with ASDC and Sciencewise. They include content in all areas of climate science from earth observation to the latest low carbon innovations and engineering.

The following gives some examples of the potential science centres have to reach people in all parts of the UK and what could be achieved if these were focussed on climate science. Glasgow Science Centre attracts 280,000 people each year of whom 90,000 (32%) are school students brought by their teachers to take part in targeted curriculum-linked science workshops and activities. Thinktank, Birmingham's Science Centre attracts 260,000 people annually, of whom 78,000 are school students taking part in science workshops and discussions. Family and leisure visitors at Thinktank take part in science shows, sleepovers, story-telling, meet the scientist and lab-based workshops. This pattern is replicated up and down the country—385,000 people visit ASDC member centres every week of the year.

The key to what science and discovery centres do is to start where their public is, and to take them on a journey rather than to impose upon them what someone feels they should know. Science centres offer families, adults and school children unusual and exciting opportunities to explore, discover, question, test and experiment on the world around them. The aim is not simply to fill people with facts, but to take them on a journey to spark their curiosity and to encourage them to continue asking questions about the world long after they leave our centres.

It is clear that the network of UK science and discovery centres and museums could mobilise in a national way to get people across the UK interested and involved in climate science and to start asking questions about what we collectively should be doing about it. Indeed ASDC already runs national programmes in this way, for example the current "Explore Your Universe" Programme in partnership with the Science and Technologies Facilities Council (STFC). However to make a national climate change programme highly effective it needs to be carefully more carefully constructed than any other.

Climate change creates a specific issue in that most people in the UK have considered it at some level, and many have an entrenched position on it. That makes the issues of trust key, and that is in part why I write. Science and discovery centres and museums are trusted voices and environments. They are not arms of Government, they are local, and are always on the side of the visitors.

[137] As well as the UK's Science and Discovery centres, ASDC membership includes all science-related National Museums who are funded by DCMS to enable free public entry.

Our approach would be to work with the fields of behavioural psychology, health and social psychology and environmental psychology all of whom have expertise that would shape what we did. In addition we would want to bring together all we collectively and internationally know about behaviour change and game theory, cognitive dissonance and delayed gratification, all of which have a bearing on why people do and do not choose to change. Much too is to be learned from all the academic and grey literature (formal published non-academic reports) on behaviour change in seat belts, drink-driving, smoking, pensions and healthy living. All of this needs to be applied to any future discussions on climate change. Likewise, we would see it important for people to explore the process of science and how we get to a point where most scientists agree, as well as opening up the mistaken assumption that most of us have that humans act rationally.

We would also want to look at innovative and experimental programmes and what has worked. For example "global conversations" run by W5, the Belfast science centre, where pupils and teachers from Northern Ireland and Republic of Ireland formed cluster groups with students in Ghana and Ethiopia and shared information on their views on climate change and sustainability and how it affects them. We would also look at the myriad of successful examples from Bristol, a European leader in sustainability and green innovation and communications. Indeed Bristol is the first UK city to win the title of "Green Capital of Europe" which it will host in 2015 because of its leadership in this area and because it has very high city wide rates of indicators such as cycling behaviours.

As a note, The UK Association for Science and Discovery Centres also sees it as vital that people in all parts of the UK have open access to the very latest climate information and evidence. Sir Mark Walport, Chief Science Advisor is therefore visiting a number of UK science and discovery centres to share the latest climate science evidence and policy with the public and school students so they can hear it firsthand.

As a nation and as a global society we have some major challenges ahead. Addressing these challenges will require both scientific entrepreneurship and fundamental societal engagement and change and we feel we can help in this. We need our young people to be confident to experiment and innovate with science, technology and engineering and to become trail-blazers for a lower carbon future. We need our adult population to better understand the sciences, encouraging them to examine evidence and lobby for the policy changes needed for a bright low carbon future. We need to help people to find the delight of exploring the world around us whilst reducing our footprint on it.

Dr Penny Fidler is the CEO of The UK Association for Science and Discovery Centres. She has a PhD in neuroscience from Cambridge University and has fourteen years experience working in the field of science engagement, including setting up a millennium science centre, running an Exhibitions and Neuroscience Consultancy and speaking in Parliament on the importance of informal science learning. She has also founded and directed many national strategic science engagement projects.

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