

RECENT CHALLENGES TO CLIMATE CHANGE SCIENCE AND ECONOMICS.

Evan Williams, Visiting Fellow David Livingstone Centre for Sustainability, Strathclyde University & Professor James Curran MBE, School of Biological & Environmental Science, University of Stirling.

Recent contributions to the debate on climate change challenge both the science and the economics behind policy responses. In this short paper we explore the nature of this challengeⁱ and address these six principal arguments:

1. Evidence doesn't support the consensus view on climate change.
2. The climate is always changing, therefore any change we observe is natural.
3. Climate models are inadequate.
4. Even if the climate is changing, change presents no serious problem.
5. Costs of harm from climate change are exaggerated.
6. Costs of controlling emissions are far higher than estimated.

Taking each of these elements in turn we will look at the evidence presented.

1. Evidence doesn't support the consensus view on climate change.

This argument is pursued on two fronts;

- *the recent temperature record shows a lull in temperature rise in the first part of this century,ⁱⁱ*
- *the ice core records show a time lag between temperature change and CO₂ increases in the atmosphereⁱⁱⁱ.*

Both of these statements are true but the argument requires us to make inferences that they undermine the consensus view that human emissions of greenhouse gasses are causing climate change.

These statements do not address other influences on the climate system, such as variations in solar radiation, atmospheric influences and natural weather variability. The appropriate comparison to make is with the temperature(s) that would have prevailed in the absence of human interventions in the highly complex climate system.

The ice core record (prior to the industrial revolution) is an illustration of the naturally functioning climate system. The current situation is quite different, for the first time, human additions of CO₂ are forcing up atmospheric concentrations in advance of temperature changes.

2. The climate is always changing.

Without it being explicitly said^v we are led to the inference that since the climate is always changing the current warming is natural.

It is true that the climate is always changing – indeed in the central narrative of “An Inconvenient Truth” is the illustration of temperature over the last 650,000 years showing a succession of ice ages and interglacial periods. However, it would be faulty logic to conclude that since the climate changed before humans existed any change we are now experiencing is therefore nothing to do with humans.^v

3. Climate models are inadequate.

It is argued that climate models do not explain every aspect of changing climate, and that the practice of regular revision of models undermines the basic theory. .

A common issue is to mistakenly equate climate models with weather models:^{vi} and to confuse the model with the theory. Identification of a gap in the model is equated with a flaw in the theory. The climate models used by the Intergovernmental Panel on Climate Change, and others, are very different from long-range weather forecasting models. The more general point of course is that models are, by definition, simplifications, and representations of, much more complex systems. They are tools.^{vii} A model can be adjusted or shown to have errors without disproving the theory on which it is based.

4. Even if climate is changing change presents no serious problem.

It is argued that we have coped well with recent warming:^{viii} Further that there are a range of temperatures at which human civilisations thrive,^{ix} and the implication is that we will therefore cope well with any further warming.

Both statements are true but they do not logically support the conclusion being offered.

An increase in global temperatures will not make the planet uninhabitable.^x

The criticism is essentially an attack on a claim that has not been made. Climatologist and ecologist don't claim we are in some “ideal” climate or that humans and animals could not survive at warmer temperatures. The mainstream contention is that both ecosystems and human infrastructure are adapted to the current climate It is the rapidity of change away from current conditions^{xi} that presents the problem. and the impacts on reasonably fixed infrastructure that are the source of much of the expected harm.

5. Costs of harm from climate change are exaggerated.

The criticism on the estimates of costs is conducted on three fronts;

- *there are benefits to climate change, and that these have been overlooked;*
- *human capacity for adaptation is ignored and,*
- *the potential for harm has another source or is exaggerated.*

It is true that there are potential benefits from climate change; that they are ignored, is generally not true. Many were identified in the latest IPCC 4th Assessment Report (Working Group II)^{xii} but are so insignificant in scale compared to the disbenefits that they are not often highlighted.

It is almost certainly true that humans will adapt or innovate, and thereby face less severe consequences of climate change^{xiii} than they would if they had not adapted. However humans would innovate in other ways to improve productivity or quality of life in the absence of climate change. The cost of harm associated with climate change has to be considered as the difference between two comparable states, with

and without climate change. With a changing climate innovation is directed to avoiding harm, without climate change innovation could be directed to making us better off.^{xiv}

It is true that there are other pressures, such as population growth on biodiversity, water supplies and so on.^{xv} It does not follow that the additional pressure of climate change is therefore unimportant. Indeed the compounding effect of both climate change and other pressures are at the heart of the mainstream concern about the effects of climate change.

In arguing the related point that in comparison with the costs of emissions reduction adaptation measures are better value the time frame is often limited to the next hundred years. This is reasonable from a practical point of view, However, reaching 2100, having done nothing to stabilise emissions, is not the same as reaching 2100 having stabilised emissions.

6. Costs of controlling emissions are higher than estimated.

There are two broad approaches adopted in making this case;

- *estimate the costs of 70-80% reductions using available technologies, and*
- *estimate the cost of a carbon tax that would be required to achieve those reductions.*^{xvi}

The difficulty with these approaches is that it assumes that all of the emissions reductions required need to be made now (with existing technology) and that the marginal cost of the last unit of emissions reduction is a good approximation of the rate of tax that would have to be levied.

In the UK, policies to reduce greenhouse gas emissions seek to secure the required targets over periods to 2050, and this implies fairly modest reductions now, becoming progressively more substantial over time. The virtue of such policies is that they give advance warning to the market of the scale of the task which provides a spur to specific innovation.^{xvii xviii}

It is a mistake to argue the cost of the tax would be found by multiplying the estimate of the tax rate by the amount of CO₂ taxed because taxes are a transfer, and any revenue raised on CO₂ could be used to reduce taxes elsewhere in the economy, at no net cost to society.^{xix}

It is argued that the tax rate would have to be high based on elasticity of demand for fuel. ^{xx}What this means is that, as the price of energy goes up, the resulting decrease in energy demand is relatively small - therefore to reduce energy use by a lot the price would have to be pushed up a very great deal.

This is absolutely true in the short run. The reason why changes in price of fuel have little effect on short-run demand rests on two very significant factors. Firstly, much of the technology that uses fuel (e.g. central heating systems, production lines in factories, cars and delivery vehicles) is only replaced over a period of time. The change in behaviour needed to reduce fuel use can therefore only be accomplished with the gradual replacement of this infrastructure. Secondly, the weak responsiveness of demand to price relates to the low availability of substitutes. So far there hasn't been much effort devoted to developing substitutes for carbon-based fuels - not surprisingly since oil and gas have been readily available and relatively inexpensive.^{xxi}

At present it is known that there are a great many opportunities for reducing fuel demand that can be achieved either at low or at no cost (taking account of the saving associated with not purchasing fuel)^{xxii}. Most current policy proposals are intended to stimulate these changes in behaviour and provide strong signals about the areas where future innovation would be desirable.

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Endnotes:

i The principal sources of the "sceptic" position are drawn from Nigel Lawson 2008, *An Appeal to Reason, A cool look at global Warming*. Duckworth Overlook. and The Channel 4 Documentary "The Great Global Warming Swindle" (GGWS) written and directed by Martin Durkin

ii "the "sustained rise" took place entirely during the last quarter of the last century" Lawson p 7. (ie 1975 to 2000) prior to that a period of "cooling" from 1940 to 1975, at a time "while the growth in man made CO₂ emissions and thus CO₂ concentrations continued relentlessly" Lawson p 14. This is used to imply that CO₂ can not possibly be to blame for changing temperatures because there were periods when CO₂ was increasing and temperature did not.

iii . "The link is the wrong way round", "CO₂ is not the cause of that [the historic] warming" and "it certainly never did in the past " (All GGWS (contributors and voice over)).

iv "What about the real world?" Lawson asks (p16) "...the Earth's climate has always been the subject of natural variation which has been wholly unrelated to man's activities."

v By way of analogy, suppose that you went to see your bank manager because someone had fraudulently withdrawn money from your account. You would find yourself deeply dissatisfied if the manager pointed out that in the normal course of events money went into your account and money went out – so it was all part of the natural functioning of your account.

vi "You start with the uncertainties of long-range weather forecasting , add to these the uncertainties of long range economic forecasting, plus the uncertainties of population forecasting, feed them all into a powerful computer and supposedly arrive at a sound basis for serious – and seriously expensive – long term policy decisions" Lawson p 24. "Models are only as good as the assumptions within them" Roy Spencer GGWS "...if you tweak parameters you can model anything" Ian Clark GGWS.

vii As soon as we consider the alternative to using models (ie not using models) we realise very quickly that even models that are imperfect are likely to be far more useful than not using them. The IPCC would have been attacked had they not used models – on the grounds that models produce the best means of making predictions.

viii "During those 25 years of gentle warming [1975-2000] the world managed pretty well" Lawson p 27,

ix "The annual average temperature in Helsinki is 5C. That in Singapore is in excess of 27C – a difference of 22C. If man can successfully cope with that, it is not at all immediately apparent why he should not be able to adapt to a change of 3C, when he is given a hundred years in which to do so." Lawson p 27-28

x "is it really plausible that there is an ideal average world temperature which by some happy chance has recently been visited on us, from which small departures in either direction would spell disaster?" Lawson p27.

xi Towns, cities and infrastructure are built around the current climate and are adapted to current climate.

xii Easterling, W.E., P.K. Aggarwal, P. Batima, K.M. Brander, L. Erda, S.M. Howden, A. Kirilenko, J. Morton, J.-F. Soussana, J. Schmidhuber and F.N. Tubiello, 2007: Food, fibre and forest products. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 273-313. The opening line of the executive summary reads "In mid- to high-latitude regions, moderate warming benefits crop and pasture yields,".

xiii This is presented as a unique insight of Lawson's that had not in fact been raised by the IPCC and others in their own reports. The assertion "...the assumption of no adaption make[s] the estimate completely worthless..." p. 41 about a single study that formed a very small part of Stern Review is disingenuous since the specific question being investigated was precisely what would the costs be in the absence of adaptation (hence the reference Lawson was able to find "assuming no adaptation"). Once that misconception is corrected, it is possible then to explore how much of those costs can thereafter be avoided by adaption. In essence Lawson is attacking one specific study for not addressing a question it didn't set out to answer. Curiously Lawson goes on to acknowledge that the practice to which he objects so strongly "...has rightly been abandoned." P 41

xiv The only way, logically, in which one could argue that the estimates of harm should be reduced to allow for innovation would be if it was being claimed that overall there will be more innovation in a climate changed world.

xv Lawson attacks estimates of effects under five headings: water, ecosystems, food, coasts, and health, to all of which he provides fairly offhand dismissals. On water, he asserts that "the problem is the huge increase in the world's population" p29. On ecosystems,

we are told "over the past two-and-a-half-million years, a period during which the planet's climate fluctuated substantially, remarkably few of the earth's species became extinct." On food, we are told there is nothing to worry about "...we are in the early stages of a revolution in agricultural technology,..." p 31. On coasts (i.e. coastal flooding), "Given our capacity to adapt to a gradual change, sea level rise of, at most, less than a-quarter-of-an-inch a year is not, frankly, on a scale to be alarmed about." p 32. On health, he dismisses any concern about heat waves by telling us "As it happens, I spent the summer of 2003 [when heat waves claimed the lives of more than 20,000 in Europe] in south-west France myself, and found it perfectly tolerable..." p 34. This reveals a misrepresentation of the detailed cost assessments. The concern is with the rapidity of change and the impacts this may have on water availability, habitats, food production systems, coastal and low lying areas and indeed health. It has never been the contention that absolute temperature changes are impossible to deal with - it is the extent to which relative changes impact on the systems, habitation, infrastructure and so on. It is almost certainly true that population increases have implications for access to safe drinking water but to conclude that climate change is therefore not an issue does not follow logically. The threats to habitats, species and biodiversity similarly come from a combination of the rapidity of climate change (relative to natural changes) and the impact of humans.

xvi Lawson does not offer alternative estimates of the costs of emissions reduction, just a general assertion that it would be too much. "All the signs are that it would prove to be very costly indeed. A key test is to consider how high a carbon tax would be needed in order to generate the necessary change in behaviour ..." p. 66.

xvii Indeed considerable strides have been made in many areas of energy efficiency in recent years with more modest taxes on fuels. There is every reason that, given the appropriate incentives, a great deal more can be done.

xviii Lawson cites examples of costly technologies that are not yet ready for widespread use. (Such as carbon capture and storage - but even then cites Jeroen Van de Veer of Shell as saying "it will take a decade to test the technology in pilot projects" p 72 which would mean that it will be ready in about 2017).

xix Indeed there would be benefit in reducing economically inefficient taxes, such as those on non-wage labour costs (in the UK known as employers national insurance) thereby tackling a distortion in the market for labour that reduces the number of people employed. In the literature this is referred to as the "double dividend"

xx "the price elasticity of demand for energy is not all that great" Lawson p 67.

xxi During the 1970's oil shock energy efficiency increased markedly - showing that given time energy demand can be much more responsive to price.

xxii See for example the Economist 8th May 2008 discussion of work by the McKinsey Global Institute.