

# Energy and Climate Change Committee inquiry into AR5

*Written submission by Marcel Crok*

## *Credentials and statement of interests*

I am a Dutch freelance science writer based in Amsterdam. Since 2005 I specialised in the global warming debate. In 2005 as an editor of the Dutch monthly popular science magazine *Natuurwetenschap & Techniek* (recently this has become the Dutch edition of *New Scientist*) I published a long and critical article about the infamous hockey stick graph featuring the criticism of Stephen McIntyre and Ross Mckitrick. Many of the issues described in that article came back in the Climategate emails.

I published a critical book in 2010 that focused on the third and fourth assessment reports of the IPCC (TAR and AR4). The Dutch Ministry of Infrastructure and the Environment then gave me funding to critically review AR5 as an expert reviewer.

Since Climategate I am in favour of a more constructive interaction between climate scientists with opposing views. Late 2012 the Ministry of Infrastructure and the Environment funded an international discussion platform, ClimateDialogue.org, that organises constructive dialogues between climate scientists with opposing views. This has been set up by the leading Dutch climate related institutes KNMI and PBL and myself.<sup>1</sup> We cover controversial topics and invite scientists with a range of views.

In 2013 I was co-author of my first peer reviewed paper (describing a European temperature shift in 1988).

## *How robust are the conclusions in the AR5 Physical Science Basis report?*

To answer this question is beyond the scope of this inquiry I would say. However your own introduction provides a good start to deal with it. You wrote: "The report concluded that, 'it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.' But it reduced the lower bound for likely climate sensitivity and for the first time did not publish a best estimate of it because of lack of agreement."

It's good that you picked up this apparent paradox. AR5 itself focused on the 95% certainty that humans are the cause of most (>50%) of the warming since 1950. Most media outlets brought this as the major news of AR5 writing things like 'how much more certainty do you want (before you act)?'. However this interpretation of the 95% claim is misleading. In a sense the 95% claim of AR5 (itself a result of expert judgment and not some sort of mathematical calculation) is a no-brainer.

To understand this we focus on this other important parameter, climate sensitivity (the rise in global temperature after a doubling of the CO2 concentration). Recently several papers have been published estimating climate sensitivity from observational data since 1850. These studies assume

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<sup>1</sup><http://www.pbl.nl/en/news/newsitems/2012/pbl-knmi-and-crok-launch-climate-discussion-platform-climatedialogueorg>

that almost *all of the warming since 1850* is due to greenhouse gases. These papers then come up with best estimates for climate sensitivity in the range of 1.5 to 2.0°C, considerably lower than the best estimate of 3.0°C that IPCC has presented in all their assessment reports so far. So claiming that at least 50% of the warming since 1950 is due to humans is meaningless. The much more important question is whether the contribution of greenhouse gases to warming is big or small. AR5 has all the ingredients to conclude that the contribution is much smaller than we have thought for the last three decades. But by not giving a best estimate for climate sensitivity it failed to communicate this important message. So IPCC failed to give policy makers its most important conclusion. And IPCC only dealt with this important decision in a footnote in the Summary for Policymakers (SPM).

The 95% claim also tells you nothing about the seriousness of the climate issue. The 95% can be completely in accordance with there being no climate problem at all. IPCC failed to explain this clearly and journalists didn't pick it up.

To conclude: the 95% claim of AR5 has been misinterpreted by most people, including policy makers and the media as the final proof that we have a huge anthropogenic climate problem. The claim itself proves no such thing and is in fact pretty meaningless.

Although it seems contradictory, there is in itself no conflict between the increasing certainty (the 95% attribution claim) and not giving a best estimate for climate sensitivity (less certainty). The 95% claim is just very conservative and tells you little about the seriousness of the climate issue.

### *Have the IPCC adequately addresses criticisms of previous reports?*

There is some encouraging progress in this area. For example in AR4 IPCC claimed greenhouse gases already influenced hurricanes. This was based on a very biased selection of the literature. Both in the 2011 IPCC SREX report and in AR5 IPCC does a much better job, admitting there is no link (yet) between all kinds of extreme weather events (hurricanes, floods, droughts) and the increase in greenhouse gas concentration.<sup>2</sup>

However there are other topics where IPCC seems to be completely unwilling to address criticisms. A notorious example is the case of long term persistence (LTP). Most people will agree that the weather of this hour is related to that of the next. Well the same can be said about climate. If this year we're in an ice age, logically next year we are still in an ice age. This is called persistence. LTP becomes relevant when you want to claim that the recent rise in global temperature of 0.8°C is statistically significant. This is important for what IPCC calls 'detection'. You first have to detect a 'significant' increase in the global temperature, before you can 'attribute' it to any cause.

To do this calculation you have to assume what kind of statistical model best fits your data. IPCC and the whole climate field for some reason has adopted the view that one can describe climate time series with a so-called AR1 model. This model assumes that this year's climate will influence that of next year but not the year after. This AR1 model is also called short term persistence. There are many papers criticising this approach however both in AR4 and now again in AR5 IPCC failed to address this issue in a satisfactory way.

In my review of AR5 I wrote:

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<sup>2</sup><http://rogerpielkejr.blogspot.nl/2013/10/coverage-of-extreme-events-in-ipcc-ar5.html>

“It is commendable that the authors mention Cohn and Lins, 2005<sup>3</sup>. Unfortunately this is the only place in the entire report where this important paper is mentioned. In their conclusions Cohn and Lins write: “[With respect to] temperature data, there is overwhelming evidence that the planet has warmed during the past century. But could this warming be due to natural dynamics? Given what we know about the complexity, long-term persistence and non-linearity of the climate system, it seems the answer might be yes...natural climatic excursions may be much larger than we imagine.” AR4 did not do a good job dealing with this topic, as is explained in McKittrick’s submission to the IAC:

[http://www.rossmckitrick.com/uploads/4/8/0/8/4808045/iac.ross\\_mckitrick.pdf](http://www.rossmckitrick.com/uploads/4/8/0/8/4808045/iac.ross_mckitrick.pdf) (page 7-9)

He mentions an [Climategate] email of [David] Parker to [Phil] Jones, who were responsible for the AR4 treatment of the Cohn and Lins paper. Parker wrote: “Maybe the biggest problem is Ross McKittrick and David Stephenson’s remarks on trends; we used only an AR-1 and they may be correct in advocating a more complex model. Our software for restricted maximum likelihood does not cope with ARMA(1,1) and may have to get John Kennedy to investigate new software using the cited references. This may be a big job but could be done after the LA3 meeting if we agree there what to do. Alternatively – as we have considered already – we could consider not citing linear trends, just overall changes of level from the smooth curves. This would save some space.” In the end Parker and Jones did cite linear trends in chapter 3 claiming the warming was highly significant. In the second draft of AR4 IPCC wrote: “Determining the statistical significance of a trend line in geophysical data is difficult, and many oversimplified techniques will tend to overstate the significance. Zheng and Basher (1999), Cohn and Lins (2005) and others have used time series methods to show that failure to properly treat the pervasive forms of long-term persistence and autocorrelation in trend residuals can make erroneous detection of trends a typical outcome in climatic data analysis.” This was a fair comment about Cohn and Lins. However after the second draft this text was removed and in appendix 3.a a much more disputatious text was introduced: “Nevertheless, the results depend on the statistical model used, and more complex models are not as transparent and often lack physical realism. Indeed, long-term persistence models (Cohn and Lins, 2005) have not been shown to provide a better fit to the data than simpler models.” This was a completely ad hoc remark without any reference to the literature. A fair treatment of this topic in AR5 is much needed. I think this discussion should be dealt with in both Ch 2 and 10.”

Ross McKittrick also raised the issue of LTP again in his AR5 review comments. Did AR5 address this issue? No. Doug Keenan, a British mathematician who has shown interest in this topic, explained in detail that AR5 didn’t give LTP a fair treatment.<sup>4</sup> Keenan’s research has recently led to many parliamentary questions by Lord Donoughue.<sup>5</sup>

So several people raised this important issue both during the AR4 and AR5 review process. Privately Parker and Jones admitted the comments of McKittrick were valid. However in the end IPCC more or less ignored the issue both in AR4 and AR5. It hasn’t even started to take the topic serious.

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<sup>3</sup> Cohn T.A., Lins H.F. (2005), “Nature’s style: naturally trendy”, *Geophysical Research Letters*, 32, L23402; doi:10.1029/2005GL024476

<sup>4</sup> <http://www.informath.org/AR5stat.pdf>

<sup>5</sup> <http://www.publications.parliament.uk/pa/ld201314/ldhansrd/text/131203w0001.htm#13120366000164>

In May of this year we organised a Climate Dialogue about LTP inviting Armin Bunde, Demetris Koutsoyiannis and Rasmus Benestad as participants.<sup>6</sup> Bunde and Koutsoyiannis have both published many papers about LTP and both are convinced that when you use an AR1 model the statistical significance of the 0.8°C is seriously overestimated. But this is what IPCC still does.

### *How much scope is there to question of the report's conclusions?*

Not enough. In general critics of the IPCC view (sceptics if you like) are not invited to participate in the writing process, as coordinating lead authors, lead authors or even contributing authors. So they can only contribute as expert reviewers. In practice an expert reviewer has very little influence. Just look again at the example of LTP given above. Several reviewers both during the AR4 and AR5 review process mentioned this important issue. In the end though it was ignored. The same can be said about Nic Lewis' important review comment to present two ranges for climate sensitivity, one based on climate models and one based on observations.

### *Can any of the areas of the science now be considered settled as a result of AR5's publication, if so which?*

Unfortunately very few things are settled in the global warming debate. There is only one solid fact: the greenhouse gas concentrations are rising and humans are causing this increase. A second fact is that the climate is warmer than a century ago. How much warmer exactly is still a matter of debate. And how much of the warming is attributable to humans is also far from settled.

### *Does the AR5 address the reliability of climate models?*

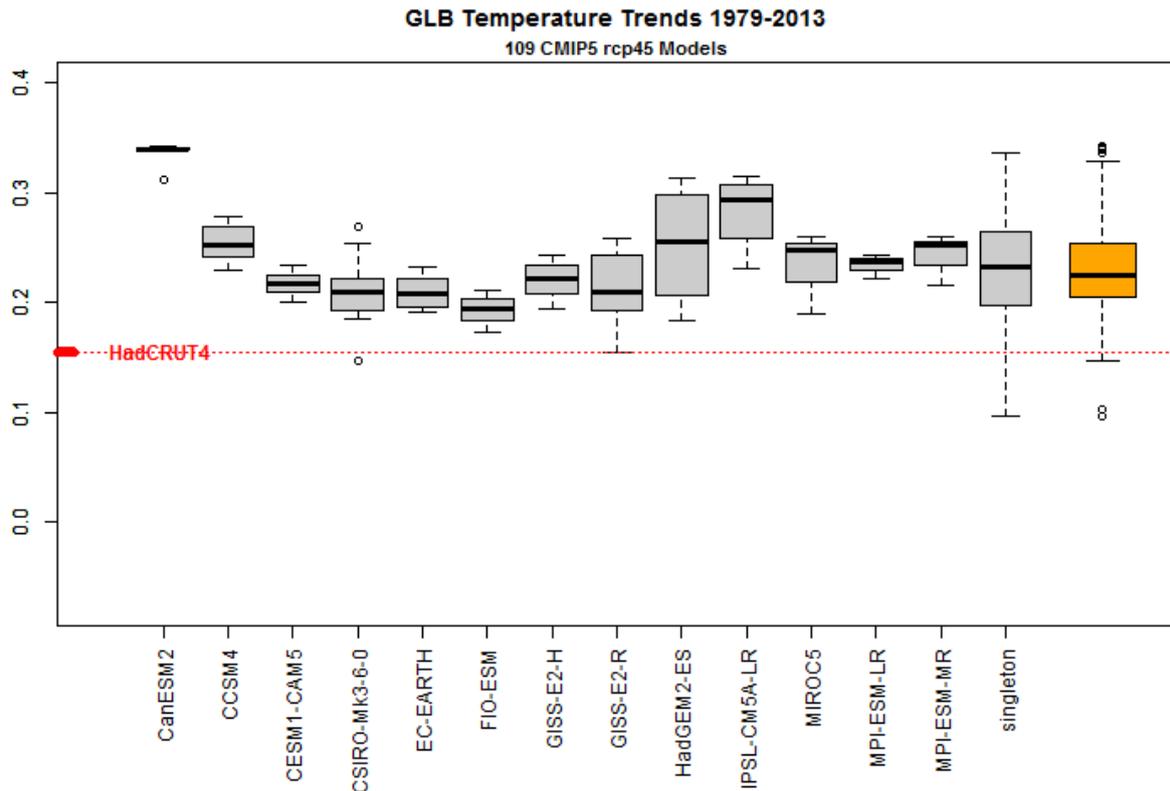
Several chapters deal with the reliability of climate models and one chapter (9) in specific terms. Climate models play a huge role in the report. All the future projections of climate in 2100 are based on these models. The reliability of the models is therefore crucial. Unfortunately, the implicit conclusion in AR5 that climate models are, overall, sufficiently reliable for projecting global warming is not supported by the evidence.

It has become increasingly clear that models don't fit the observations very well, even when you look at the global average temperature. Stephen McIntyre showed in a blog post<sup>7</sup> that models on average show 50% more warming during the last 35 years than the real climate:

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<sup>6</sup><http://www.climatedialogue.org/long-term-persistence-and-trend-significance/>

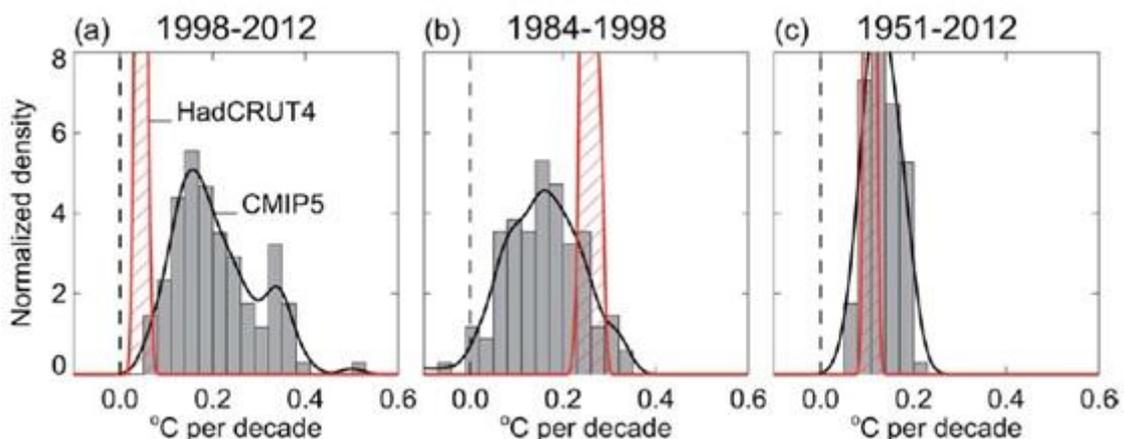
<sup>7</sup><http://climateaudit.org/2013/09/24/two-minutes-to-midnight/>



**Modelled versus observed decadal global surface temperature trend 1979–2013**

Temperature trends in °C/decade. Virtually all model climates warmed much faster than the real climate over the last 35 years. Source: <http://climateaudit.org/2013/09/24/two-minutes-to-midnight/>. Models with multiple runs have separate boxplots; models with single runs are grouped together in the boxplot marked 'singleton'. The orange boxplot at the right combines all model runs together. The red dotted line shows the actual increase in global surface temperature over the same period per the HadCRUT4 observational dataset.

Instead of showing this insightful graph IPCC presented this (Figure 1 from Box 9.2):

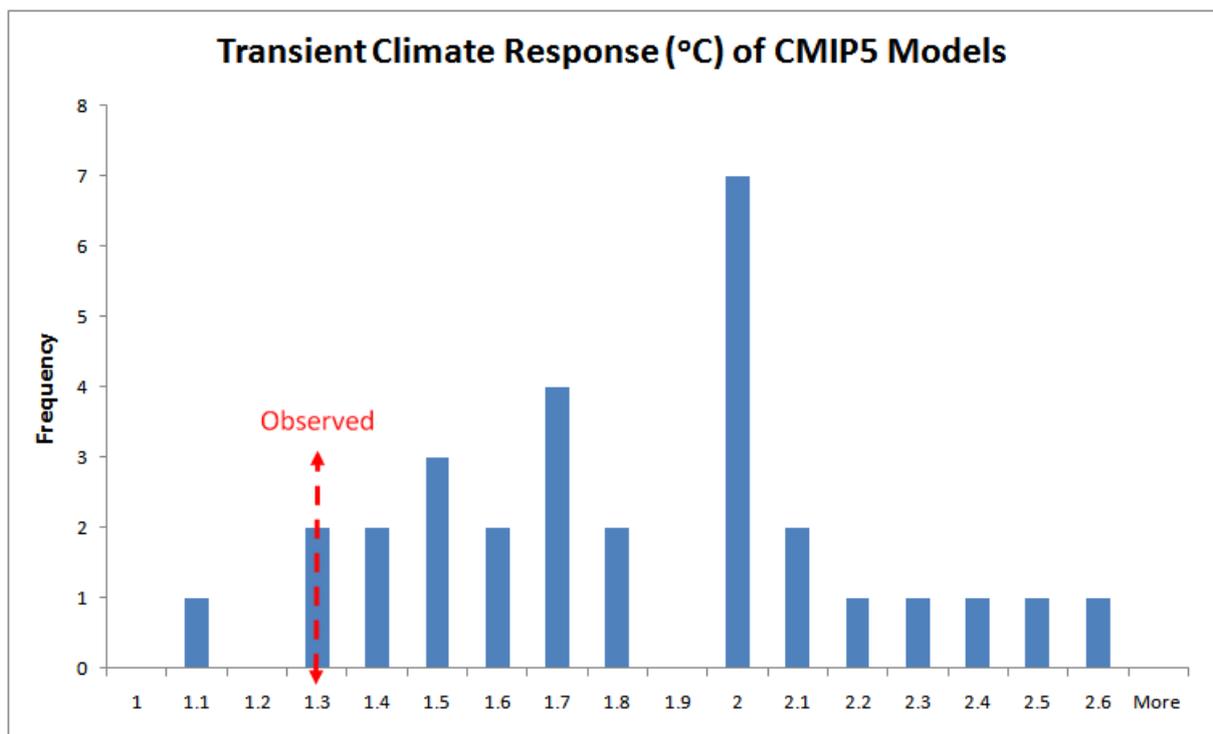


**Frequency distribution of trends in global mean surface temperature from 114 CMIP5 model runs**

Model runs are grey bars for the periods (a) 1998–2012, (b) 1984–1998, (c) 1951–2012. The comparison is with the uncertainty range for the observed trend per the HadCRUT4 dataset (red, hatched) over the same periods. From IPCC Fifth Assessment Report, Box 9.2, Figure 1.

In this figure the IPCC attempts to show that the recent hiatus is more to do with choosing the hot El Niño year 1998 as a starting point. Panel (a) shows that CMIP5 models overestimate the HadCrut4 global temperature trend since 1998. However in panel (b) one can see that models tend to underestimate the observations in the period 1984–1998. So the message is: if you look at short periods of 15 years the models are sometimes too hot and sometimes too cold. Panel (c) then suggests models are performing well on a longer timescale, in this case 60 years. That is not surprising, since models are likely to have been tuned so that they provide a reasonable match to the global surface temperature rise over the historical simulation period, most of which occurred after 1950. The discrepancy between models and observations over the last 35 years is conveniently not shown. This period is long enough to be relevant for climate.

Another important discrepancy between models and observations is laid down by Nic Lewis in another Climate Audit blog post.<sup>8</sup> Here Lewis shows that the so-called Transient Climate Response (TCR), a more policy relevant parameter for climate sensitivity, in the models is considerably higher than the TCR that is based on the best observational evidence:



#### Transient climate response distribution for CMIP5 models in AR5 Table 9.5

The bar heights show how many models in Table 9.5 exhibit each level of TCR

Again, AR5 does not show a similar graph but gives this statement(Box 12.2):

<sup>8</sup><http://climateaudit.org/2013/12/09/does-the-observational-evidence-in-ar5-support-its-the-cmip5-models-tcr-ranges/>

“the ranges of TCR estimated from the observed warming and from AOGCMs agree well, increasing our confidence in the assessment of uncertainties in projections over the 21st century.”

How can this be right, when the average model TCR is 40% higher than an observationally-based best estimate of 1.3°C, and almost half the models have TCRs 50% or more above that? The IPCC obscured this large discrepancy between ‘models’ and ‘observations’ by not showing a graph like our Figure 7 and by a misleading statement in the full report.

So models overestimate the warming of the real climate in the last 35 years by 50%. And the same models have ECS and TCR values that are considerably higher than estimates based on observations indicate. Both these important observations were not made explicitly by the IPCC in AR5.

### *Has AR5 sufficiently explained the reasons behind the widely reported hiatus in the global surface temperature record?*

Stephen McIntyre showed in detail<sup>9</sup> that the IPCC didn’t take the hiatus serious enough until too late in the AR5 process. In the first draft they ignored the issue. In the SOD they dealt reasonably well with the hiatus, showing that models don’t simulate it. In the final draft AR5 then came up with a new graph that obscured the mismatch between models and observations. This graph almost certainly contains an error.<sup>10</sup> Note that this final graph was never presented to the expert reviewers. Is IPCC going to acknowledge this error and fix it?

### *Do the AR5 Physical Science Basis report’s conclusions strengthen or weaken the economic case for action to prevent dangerous climate change?*

It definitely weakens the case for action, although IPCC nowhere admits this. There is now good observational evidence for a substantially lower climate sensitivity. This means considerably less warming is to be expected in the future. Meanwhile it has become clear that extreme weather events (hurricanes, floods, droughts) have not become worse. This means that in the coming decades any climate money is best spent on adaptation, i.e. helping those regions vulnerable to extreme weather events to be better prepared for the next event that sooner or later will take place. The case for mitigation is less urgent and this means that as a society we could first focus on new technologies that make decarbonisation possible with lower costs than the now available options like wind, solar, biomass etc.

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<sup>9</sup><http://climateaudit.org/2013/09/24/two-minutes-to-midnight/> and

<http://climateaudit.org/2013/09/30/ipcc-disappears-the-discrepancy/>

<sup>10</sup><http://climateaudit.org/2013/09/30/ipcc-disappears-the-discrepancy/>