

QUESTIONS FOR THE RECORD
The Honorable Lamar Smith (R-TX)
U.S. House Committee on Science, Space, and Technology

Examining the UN Intergovernmental Panel on Climate Change Process

Thursday May 29, 2014

Questions for Dr. Pielke

1. Dr. Oppenheimer indicates that the IPCC receives tens of thousands of comments and, “we have to address every single one of them...until comments are adequately addressed.” Do you agree with this characterization of the IPCC comment process?

The comment process of the IPCC is seriously flawed. To state that the comments are “adequately addressed” begs the question as to who decides what is “adequate”. In my view, the IPCC WG1 report is not a complete and adequate assessment of the current understanding of the climate system

2. You discuss the range of anthropogenic climate forcings, including land use and black carbon. Could you elaborate on climate forcings not directly related to fossil fuels?

I discuss this in earlier House testimony –

Pielke Sr., Roger A., 2008: A Broader View of the Role of Humans in the Climate System is Required In the Assessment of Costs and Benefits of Effective Climate Policy. Written Testimony for the Subcommittee on Energy and Air Quality of the Committee on Energy and Commerce Hearing “Climate Change: Costs of Inaction” – Honorable Rick Boucher, Chairman. June 26, 2008, Washington, DC., 52 pp

where I wrote in my oral testimony

[http://pielkeclimatesci.files.wordpress.com/2009/09/pielke_oral_testimony.pdf] that

The human climate forcings that have been ignored, or are insufficiently presented in the IPCC [Intergovernmental Panel on Climate Change] and CCSP [US Climate Change Science Program] reports include

- *The influence of human-caused aerosols on regional (and global) radiative heating*
- *The effect of aerosols on clouds and precipitation*
- *The influence of aerosol deposition (e.g. soot; nitrogen) on climate*
- *The effect of land cover/ land use on climate*

- *The biogeochemical effect of added atmospheric CO₂*

Thus climate policy that is designed to mitigate the human impact on regional climate by focusing only on the emissions of CO₂ is seriously incomplete unless these other first-order human climate forcings are included, or complementary policies for these other human climate forcings are developed. Moreover, it is important to recognize that climate policy and energy policy, while having overlaps, are distinctly different topics with different mitigation and adaptation options.

This failure to broaden out their perspective has continued with the 2013 IPCC report and in the US NCA. Indeed, they continued to ignore the findings in the 2005 NRC report

National Research Council, 2005: [Radiative forcing of climate change: Expanding the concept and addressing uncertainties](#). Committee on Radiative Forcing Effects on Climate Change, Climate Research Committee, Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies, The National Academies Press, Washington, D.C., 208 pp.

where it is written

... the traditional global mean TOA radiative forcing concept has some important limitations, which have come increasingly to light over the past decade. The concept is inadequate for some forcing agents, such as absorbing aerosols and land-use changes that may have regional climate impacts much greater than would be predicted from TOA radiative forcing.

...Regional variations in radiative forcing may have important regional and global climatic implications that are not resolved by the concept of global mean radiative forcing. Tropospheric aerosols and landscape changes have particularly heterogeneous forcings. To date, there have been only limited studies of regional radiative forcing and response.... Regional diabatic heating can also cause atmospheric teleconnections that influence regional climate thousands of kilometers away from the point of forcing.

Several types of forcings—most notably aerosols, land-use and land-cover change, and modifications to biogeochemistry—impact the climate system in nonradiative ways, in particular by modifying the hydrological cycle and vegetation dynamics. Aerosols exert a forcing on the hydrological cycle by modifying cloud condensation nuclei, ice nuclei, precipitation efficiency, and the ratio between solar direct and diffuse radiation received. Other nonradiative forcings modify the biological components of the climate system by changing the fluxes of trace gases and heat between vegetation, soils, and the atmosphere and by modifying the amount and types of vegetation. ...

The policy recommendation in that report [which has been ignored by the IPCC and the NCA] includes

It is important to communicate the expanded forcing concepts as described in this report to the policy community and to develop the tools that will make their application useful in a policy context.”

Another source of information on climate forcings other than those from fossil fuel emissions is in the 2010 American Meteorological Statement Inadvertent Weather Modification [http://www.ametsoc.org/policy/2010inadvertentweather_mod_amsstatement.html] where it is written

This statement highlights the causes and possible effects of inadvertent weather modification at local and regional scales due to aerosol and gas emissions and to changes in land use. The known effects can have unanticipated and often undesirable socioeconomic consequences.....

a. Aerosol radiative effects

By partially blocking solar radiation from heating the surface, air pollutants lower surface heating and evaporation rates. This slows vertical air motions, and hence causes slower dispersal rates of air pollutants, and suppresses formation of convective clouds and precipitation. Reduced surface evaporation has major implications for the global hydrological cycle and how it responds to the combined forcing of GHGs, land use change, and aerosol pollution. In addition, surface deposition of dark aerosols accelerates ice-melt rates, hence affecting water resources. While these conclusions are based on sound physical meteorology, many of these effects are yet to be quantified.

b. Cloud-mediated effects of aerosol

Aerosols act mostly as cloud-drop condensation nuclei (CCN), and some of them as ice nuclei (IN), both of which change cloud radiative and precipitation properties in complex ways. Over oceans, emissions from fossil-fuel-burning ships produce tracks, observed to dramatically influence the extent and persistence of local shallow cloud cover, reducing the amount of solar radiation received at the surface and enhancing the amount reflected back to space. Aerosols also suppress precipitation from shallow or short-lived clouds (e.g., orographic cap clouds). Their impacts on deep convective clouds are much less certain, but are of potentially great importance. Recent research suggests that, depending on meteorological conditions, aerosols can either increase or decrease rainfall from such clouds. In warm moist atmospheres, aerosols often invigorate deep convective clouds, usually resulting in greater electrical activity, stronger damaging winds, and a greater likelihood of flash floods. Studies indicate that aerosols might also modulate the intensity of tornadoes and hurricanes.

c. Changes in land use

One example of significant land use change is the rapid global increase in urbanization and its associated changes in land surface properties and topography that create "urban heat islands" and urban barrier effects that perturb regional air flows, which thus redistributes precipitation, runoff, and flood risk over and around cities. Land-use changes alter surface albedos, as well as surface fluxes of heat, water vapor, and momentum to the atmosphere, and thus modify local and regional atmospheric circulations, which in turn can modify weather. For example, when a forest is removed and replaced by an agricultural field, it can result in a significantly different albedo, especially after a snow storm. Artificial lakes, and wind and solar farms also change the surface fluxes and albedo. Such changes also occur indirectly through increases in nitrogen

deposition and atmospheric CO₂, which alter leaf area amounts and thus the portioning of latent and sensible heat fluxes. Poor agricultural practices that favor wind erosion, such as from summer fallow, overgrazing, and deforestation, as well as from tillage, can produce large quantities of dust that absorb and reflect solar radiation thereby modifying clouds and precipitation processes.

d. Integrated effects

The cumulative changes in surface and atmospheric heat and moisture profiles modify atmospheric circulation and weather patterns on all scales, including synoptic storm tracks, in ways that are just beginning to be explored. In the aggregate, these changes can affect air quality, ecosystems, and water resources. The cumulative impacts of inadvertent weather modification may thus result in local or regional-scale climatic alterations superimposed on, and interacting with, natural and GHG-induced climate variability and change. Understanding of inadvertent weather modification, still in its infancy, is thus necessary for understanding the sources, triggers, and response mechanisms of climate change.

The IPCC and NCA reports chose to ignore these findings and, thus, have provided policymakers with biased assessments.

3. Dr. Tol's testimony stated that, following the 2010 review of the IPCC process by the world's science academies, the recommended reforms were, in his words, "by and large ignored." Have there been any significant reforms implemented?

The 2013 IPCC report continues to be a narrowly focused report which is clearly intended for specific policy actions. While they claim to be reporting objectively on climate science, the assessment is actually stealth advocacy. I do not see that any reforms have been implemented which change their flawed approach.

4. Do you agree with the principle that national or international climate policy should be based on scientific information, data, and models that are transparent and reproducible?
 - a. Are there any barriers to the climate science community, the IPCC, or the U.S. government requiring transparency and reproducibility in the science used to develop or justify policy?

Transparency and reproducibility are essential components of the sound scientific process. This includes model tests against real world observations. There is no reason that transparency and reproducibility should not be a fundamental requirement for these assessments.

5. The Chairman of the IPCC has stated that "IPCC studies only peer-review science. Let someone publish the data in a decent credible publication... otherwise we can just throw it into the dustbin."

- a. Do you agree with this characterization?
- b. A citizen audit of the 2007 IPCC report found that, of the more than 18,000 citations in the report, more than 30 percent were actually to non-peer reviewed science. Has this process been fixed since 2007?
- c. Similarly, the 2010 InterAcademy Council review of the IPCC “found few instances of information flagged” as not being peer reviewed. Has this process been fixed since 2010?
- d. Do you find that the peer review process is a sufficient guarantee of impartial evaluation of scientific work?

Peer review is an essential part of the scientific process. However, it is not the only source of solid scientific information. Indeed, with the internet, weblogs, with their vigorous exchange of comments serves as an effective review. Excellent examples of non-standard excellent scientific studies can be found on the weblog posts such as this recent one by Bob Tisdale [<http://wattsupwiththat.com/2014/06/18/may-2014-global-surface-landocean-and-lower-troposphere-temperature-anomaly-update/>].

The citation of non-peer reviewed studies is, therefore, not a problem as long as it is transparent, reproducible, and has open, publically available comments.

6. As part of the 2010 InterAcademy Council review, IPCC participants stated that “as far as I can tell there is no data quality assurance associated with what the IPCC is doing...” Another stated that “quality assurance and error identification is not existent.”
 - a. Science used for regulatory purposes in this country are supposed to be subject to information quality and peer review requirements. In light of the fact that IPCC assessments have been used to justify the regulation of greenhouse gases, are you confident that the science disseminated by IPCC meets basic data quality requirements?

The multi-decadal climate model projections presented in the IPCC and NCA reports fails to perform a basic data quality assessment of the robustness of their projections. This failure also applies to claims to attribute extreme weather events to a particular human climate forcing.

I documented the failings of the multi-decadal climate predictions when run in a hindcast mode in my written testimony.

7. Everyone from the President to the USA Today has cited a statistic that 97 percent of scientists agree that humans cause climate change and we need to do something about it. Are you outside the scientific mainstream? And do you find this statistic credible?
 - a. In light of the much-hyped “97% consensus” on climate change, you published a 2009 study entitled “Climate Change: The Need to Consider Human Forcings besides Greenhouse Gases.” What were the key findings?

I certainly am not out of the scientific mainstream. My research papers are widely cited [e.g. see <http://scholar.google.com/citations?user=ZCFFOQcAAAAJ&hl=en&oi=ao>] where they list over 28000 citations of my papers.

The 97% consensus statement is actually nonsensical. If the question is “do humans have an influence on the climate”, no climate scientist would reject that assertion. However, if the question is “do humans dominate climate change through the emission from fossil fuel combustion”, there is a much greater diversity of views.

We addressed this question in the paper you mention. This paper was co-authored by 19 Fellows of the American Geophysical Union. The paper is

Pielke Sr., R., K. Beven, G. Brasseur, J. Calvert, M. Chahine, R. Dickerson, D. Entekhabi, E. Foufoula-Georgiou, H. Gupta, V. Gupta, W. Krajewski, E. Philip Krider, W. K.M. Lau, J. McDonnell, W. Rossow, J. Schaake, J. Smith, S. Sorooshian, and E. Wood, 2009: Climate change: The need to consider human forcings besides greenhouse gases. *Eos*, Vol. 90, No. 45, 10 November 2009, 413. Copyright (2009) American Geophysical Union.
<http://pielkeclimatesci.files.wordpress.com/2009/12/r-354.pdf>

In that paper we discussed three hypotheses and wrote

Hypothesis 1: Human influence on climate variability and change is of minimal importance, and natural causes dominate climate variations and changes on all time scales. In coming decades, the human influence will continue to be minimal.

Hypothesis 2a: Although the natural causes of climate variations and changes are undoubtedly important, the human influences are significant and involve a diverse range of first- order climate forcings, including, but not limited to, the human input of carbon dioxide (CO₂). Most, if not all, of these human influences on regional and global climate will continue to be of concern during the coming decades.

Hypothesis 2b: Although the natural causes of climate variations and changes are undoubtedly important, the human influences are significant and are dominated by the emissions into the atmosphere of greenhouse gases, the most important of which is CO₂. The adverse impact of these gases on regional and global climate constitutes the primary climate issue for the coming decades.

These hypotheses are mutually exclusive. Thus, the accumulated evidence can only provide support for one of these hypotheses. The question is which one?

Hypotheses 2a and 2b are two different oppositional views to hypothesis 1. Hypotheses 2a and 2b both agree that human impacts on climate variations and changes are significant. They differ, however, with respect to which human climate forcings are important. Because hypothesis 1 is not well supported, our scientific view is that human impacts do play a significant role within the climate system. Further, we suggest that the evidence in the peer- reviewed literature (e.g., as

summarized by National Research Council (NRC) [2005]) is predominantly in support of hypothesis 2a, in that a diverse range of first- order human climate forcings have been identified.

We therefore conclude that hypothesis 2a is better supported than hypothesis 2b, which is a policy that focuses on modulating carbon emissions. Hypothesis 2b as a framework to mitigate climate change will neglect the diversity of other, important first- order human climate forcings that also can have adverse effects on the climate system. We urge that these other climate forcings should also be considered with respect to mitigation and adaptation policies.

In addition to greenhouse gas emissions, other first- order human climate forcings are important to understanding the future behavior of Earth's climate. These forcings are spatially heterogeneous and include the effect of aerosols on clouds and associated precipitation [e.g., Rosenfeld et al., 2008], the influence of aerosol deposition (e.g., black carbon (soot) [Flanner et al. 2007] and reactive nitrogen [Galloway et al., 2004]), and the role of changes in land use/land cover [e.g., Takata et al., 2009]. Among their effects is their role in altering atmospheric and ocean circulation features away from what they would be in the natural climate system [NRC, 2005]. As with CO₂, the lengths of time that they affect the climate are estimated to be on multidecadal time scales and longer.

Therefore, the cost- benefit analyses regarding the mitigation of CO₂ and other greenhouse gases need to be considered along with the other human climate forcings in a broader environmental context, as well as with respect to their role in the climate system. Because hypothesis 2a is the one best supported by the evidence, policies focused on controlling the emissions of greenhouse gases must necessarily be supported by complementary policies focused on other first- order climate forcings. The issues that society faces related to these other forcings include the increasing demands of the human population, urbanization, changes in the natural landscape and land management, long- term weather variability and change, animal and insect dynamics, industrial and vehicular emissions, and so forth. All of these issues interact with and feed back upon each other.....

The evidence predominantly suggests that humans are significantly altering the global environment, and thus climate, in a variety of diverse ways beyond the effects of human emissions of greenhouse gases, including CO₂.....

... global climate models do not accurately simulate (or even include) several of these other first- order human climate forcings, policy makers must be made aware of the inability of the current generation of models to accurately forecast regional climate risks to resources on multidecadal time scales.

It is these three hypotheses that should have been discussed in the 2013 IPCC and 2014 NCA reports. Unfortunately, and erroneously, they adopted Hypothesis 2b which, is shown in our paper, is not supported by the scientific evidence.

8. Recently the President announced new regulations on greenhouse gases emissions for existing power plants. Do you believe this would have a measurable effect on global temperature by the end of this century?

Based on the models that were used by the IPCC, the effect of this particular regulation on the global average temperature would be minimal. There would be, based on the EPA assessment, a reduction of criteria air pollutants that are emitted from coal fired power plants; this conclusion should be confirmed independently.

QUESTIONS FOR THE RECORD
The Honorable Mo Brooks (R-AL)
U.S. House Committee on Science, Space, and Technology

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Questions for Dr. Pielke

1. The Administration knows that the US actions, as proposed by the EPA, will not affect the climate in any significant way. Their “hope” is that this will lead other nations to reduce their emissions so that together there might be a reduction that is at least noticeable. Nations like China and India will continue to see steep rises in emissions as they develop their economies, lift citizens out of poverty, and provide better standards of living demanded by their people. On the other hand, Japan and Germany are two strong advocates of reducing CO2 emissions and continue to spend billions to achieve this goal.
 - a. How many new coal-fired power plants have Japan and Germany recently completed or will be completing in the near future?
 - b. What are the projections for CO2 emissions in Japan and Germany for the next decade or more?
 - c. If two of the most “environmentally active” nations (Japan and Germany) will act to cause CO2 emissions to rise, what “hope” is there that any country will follow the U.S. when the demands for poverty alleviation will always trump unprovable environmental concerns?

Questions #1 and #2, unfortunately, are outside of my area of expertise. I recommend the book by my son [The Climate Fix - http://sciencepolicy.colorado.edu/publications/special/climate_fix/] and his subsequent research and publications on this topic in order to address these important questions that you have asked.