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On

Examining the UN Intergovernmental Panel on Climate Change Process for the Fifth Assessment Report

My name is Michael Oppenheimer. I am the Albert G. Milbank Professor of Geosciences and International Affairs at Princeton University and a member of the faculties of the Department of Geosciences and the Woodrow Wilson School of Public and International Affairs. I would like to thank Chairman Smith and the members of this committee for inviting my testimony at this hearing. The views expressed in this testimony are my own. I am not speaking as an official representative of either the Intergovernmental Panel on Climate Change (referred to in this testimony as IPCC) or Princeton University. IPCC has served a critical function in providing governments regular assessments of the consensus view in the scientific community on the state of the science of climate change. I welcome the opportunity provided by this hearing to explain the IPCC process to this committee and the broader public. Let me first describe my professional background and relationship with IPCC. Full curriculum vitae are attached to this testimony (Appendix 1).

I received a PhD in chemical physics from the University of Chicago and served as a postdoctoral fellow and then Atomic and Molecular Astrophysicist at the Harvard Smithsonian Center for Astrophysics, researching Earth's upper atmosphere. Subsequently, I served as Chief Scientist for the Environmental Defense Fund, a private, not-for-profit research and advocacy environmental organization (where I continue to provide scientific advice). In 2002, I became a professor at Princeton University. I have published over 140 articles in professional journals. Almost all of those published over the past 25 years are related to climate change science and climate change policy. My current research focuses on modeling the contribution of the Greenland and Antarctic ice sheets to past and future sea level changes; the risk to coastal areas from sea level rise due to global warming; and adaptation to climate change, sea level rise, and the risk of extreme events and climate-related disasters. Furthermore, I collaborate in a long term, ongoing study of scientific assessments and the assessment process (called *Assessing Assessments*, including IPCC's), which was funded by the National Science Foundation during the period 2010-2013.[1]

My relationship with IPCC goes back to its First Assessment Report, issued in 1990. I have served as an author (either as Contributing Author, Lead Author, or Coordinating Lead Author) of every IPCC Assessment Report as well as the Special Report on *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (referred to as SREX). My most recent involvement is in the Working Group II contribution to the Fifth Assessment Report, as a Coordinating Lead Author for Chapter 19, entitled *Emergent Risks and Key Vulnerabilities*. I also currently serve on the Core Writing Team for the Synthesis Report of the Fifth Assessment.

Personally, I have found participating in IPCC to be highly rewarding. The motivations of a few dozen other scientists we have interviewed to date in the development of the *Assessing Assessments* project are similar to my own: An opportunity to engage with the latest science across a very broad range of subject matter, a sense of professional obligation to make the results of our findings accessible to policy makers, and environmental concern - a desire to contribute a

scientist's perspective to understanding and averting the high-risk outcomes that characterize projected climate change. However, I would like to make clear that I have never hesitated to provide constructive, public criticism of IPCC when I thought it was warranted and could contribute to the improvement of the IPCC process, particularly in the wake of the Fourth Assessment Report. [2] It is to IPCC's credit that, unlike the situation with many other institutions, those who have been critical, even severely so, are invited to continue and even enhance their engagement in the process. IPCC appears capable of learning, adapting, and improving, making it an example in many respects of the kind of institution we will need to help us grapple with the climate problem.

IPCC Structure and the Development of Assessments[3]

The most important thing to understand about IPCC is that "The Panel" is composed of representatives of 195 governments. Scientists participate as authors of IPCC reports on a voluntary basis in three Working Groups that develop reports on the physical science of climate change; climate change impacts, adaptation and vulnerability; and mitigation of climate change. Assessments of the full range of the climate problem are published every 6-7 years; special reports on narrower topics (such as SREX, noted above) are occasionally published in the interim between full assessments.

The IPCC chair and the chairs of the three working groups for each assessment cycle are elected by the Panel, and the Panel also approves the outlines for each report.

Author Selection

The charge to authors is to provide an assessment of the peer reviewed journal literature and other literature ("non-journal literature" such as government reports) relevant to climate change and where possible, present a consensus view of the relevant expert community. Absent consensus in the scientific community, the goal is to characterize the range of views in the literature. Names of potential authors are suggested by governments to IPCC. The US has an open selection process that allows anyone to propose a name including their own. All names are forwarded by the US government to IPCC, which evaluates the suggestions in light of level of professional expertise and the need for balance in terms of expertise, national representation, and institutional affiliation, as noted below.

In developing the assessment conclusions, authors apply their expert judgment to weigh the value of the various contributions to the literature. Because substantial uncertainty attaches to many aspects of climate change, the authors are drawn from a wide range of technical, institutional, and national backgrounds in order to assure that the process of making such judgments captures the full range of views in the scientific community and that to the extent possible, bias does not creep into the process. Author areas of expertise range very widely from basic atmospheric processes to implementation of adaptation programs at the community level.

National representation is also broad but still is over-weighted toward the US and Europe. For example, for the Working Group II Fifth Assessment Report, author affiliations were 19% US and 26% Europe.[4]

Institutional affiliation is dominated by experts from universities and government and private research institutions but has included a breadth ranging from ExxonMobil to Greenpeace. Over eight hundred authors participated in the three working groups writing the Fifth Assessment Report.

Several studies have compared projections of IPCC reports to actual outcomes, providing a basis to assess bias. Overall, if there is a significant bias, it reflects the professional caution of scientists.[5] In this regard, it is important to note that assessments by the US National Academy of Sciences, the other major national academies around the world, the major scientific professional societies relevant to climate change, and the American Association for the Advancement of Science, have arrived at judgments largely similar to IPCC's.

The Review Process

Each report consists of chapters that go through three levels of comprehensive review, further reducing the risk of bias. The first is informal, by scientists chosen by working group members, some of whom also may be authors of other chapters. The draft is revised in response to these comments. A second, formal review is then performed by experts whose names have been forwarded to IPCC by governments and many of whom are independent of the governments and play no role in IPCC. The draft is revised, and each comment must be responded to individually; how it is dealt with in the revised text must be explained, as must any rationale for rejecting the comment. The responses are tabulated and are later posted for the public. A final draft is reviewed by experts associated with governments. Again, comments must be individually addressed and responses are made public along with the drafts. In both formal reviews, comments are also considered from any expert who wishes to submit them, not merely those selected by governments. I am not aware of any scientific review process which approaches IPCC's in its thoroughness. For Working Group II, the one with which I was associated in the Fifth Assessment, over 50,000 review comments were received from over 1700 reviewers.[6] That the review process is fairly transparent with review comments and author responses publicly posted differentiates the IPCC process from the generally-closed peer review at journals. A key role is played by Review Editors who independently review the responses that each chapter makes to review comments in order to assure their completeness.

Approval of the Summary for Policymakers (SPM)

Each Working Group report is accompanied by a ***Summary for Policymakers*** which captures the key findings. It is important to note that these documents (and the underlying chapters) are

supposed to be *policy relevant* but not *policy prescriptive*. IPCC assesses the effectiveness of policies but does not recommend that any particular policy or set of polices be adopted. Each Summary for Policymakers goes through two rounds of review, much like the chapter reviews described above, although the final round is by governments only. The draft SPM is then reviewed *word by word* at a Plenary Session of the governments of the Panel before final approval is given. This is the process that most people are familiar with and that has stirred the greatest controversy, so let me expand on it a bit. My observations are first-hand, based on my participation in four such sessions since 1995. Most recently, I participated in the approval of the SPM of Working Group II at Yokohama, Japan, in March. Representatives from 115 governments attended.[3] They worked diligently with the authors to produce a user-friendly document that was faithful to the underlying chapters. The proceedings were largely collaborative but occasionally confrontational as difficult questions of wording, both semantic and substantive, were worked out in sessions that went on most of the day and sometimes through much or all of the night.

Some of the government delegates are also experts, some are diplomats, and some are both. The objective of the approval process is to assure that the document not only *accurately* reflects the underlying chapters but that the language is *clear*. Governments need to understand what the scientists are saying or else the entire process would be a waste of time. Scientists are not known for their ability to communicate clearly in the vernacular so it is crucially important that government representatives participate in the process of developing the final version.

At the same time, government representatives are not always as knowledgeable about the technical details of the assessment as the experts, nor as free from political considerations. The last word on any statement is held by the scientists, who exercise *an effective veto power* over the insertion of any statement into the SPM. As reportedly happened during the approval session for the WGIII SPM in April, material scientists would have preferred to retain is sometimes removed at the behest of governments. But no statement that the scientists present consider to be factually untrue and not representative of the science can survive. In the end, the SPM is approved by governments.

Admittedly, the SPM approval process is imperfect. On the plus side, it results in a clearer document, and importantly, one that the governments accept as their own. In this way, it is distinct from any other climate assessment performed by any other organization. This outcome is part of the reason IPCC attained a special status as a "go-to" source for governments. On the minus side, in my view and the view of some of my colleagues, there have been occasions where government interventions, by causing omissions, have diluted IPCC findings. It is worth noting that government intervention sometimes strengthens findings by clarifying or highlighting them or advancing them from chapters to SPM. However, my belief is that on the whole across the working group reports with which I have been involved, the documents have become much clearer as a result of this singular (some would say peculiar) approach, have overwhelmingly

retained their important findings, and as a result of government collaboration have been much more widely influential than would otherwise have been the case.

Suggestions for Improving the IPCC Process

Assessment have been an effective tool for providing insights on technical matters to governments at least since the establishment of the National Academy of Sciences by President Lincoln in 1863. Nevertheless, IPCC was in many ways an experimental approach to assessment, and after 25 years, it is certainly timely to evaluate the experience and make adjustments. This process was already begun with the invitation to participants from the IPCC Chairman at the end of the Fourth Assessment to suggest changes in the process, and continued with the report of the InterAcademy Council in 2010.[7] My impression is that some but not all of the recommendations of the latter report were adopted, most importantly, strengthening the hand of the Review Editors. Governments have already begun another round of introspection and potential revision and even restructuring of IPCC, as evidenced by comments submitted by governments in relation to a call from IPCC last fall and more recently a request to authors.

My own recommendations for changes to IPCC procedures are as follows:

- **More frequent but briefer reports.** As effective and credible as IPCC assessments have been as a reflection of expert consensus, they consume much too much time of too many scientists who otherwise could be spending their time on research. While early IPCC reports were critical for establishing what was known about climate change, the gains in terms of new insights from full assessments have not been great enough recently to justify this diversion of experts. Instead, IPCC should focus on producing a larger number of briefer, more focused reports on questions of immediate interest to policy makers. SREX provides an example of such a report but the process could be slimmed down further. Potential topics could include an updated look at sea level rise with a special attention to the role of ice sheets; a close examination of the potential for a large release of methane, a potent greenhouse gas, from warming marine sediments; geoengineering as an abatement strategy; the effect of climate change on food security; and the potential role of shale gas in carbon mitigation with a view toward evaluating the leakage issue. These could be completed in one year each, including one or more formal review cycles.

- **Increase transparency.** As far as IPCC has come by posting review comments and drafts, the process of author deliberation and judgment remains shrouded. IPCC should be concerned with spelling out the full range of author views, not just their consensus. I strongly urge that IPCC take two steps to lift the veil: 1) Along with its

consensus findings, publish a record of significant divergences of viewpoints among authors, if any, and identify those holding each view. While I do not believe that such differences are common, when they do occur and indirectly become public, they can undermine IPCC's credibility in a broader community. A direct approach is called for; 2) Allow researchers to study IPCC thoroughly, including how decisions are reached by author/experts, in order to better understand how the process works and how it may be improved (I and my collaborators in *Assessing Assessments*, and others have made specific proposals for such research to IPCC).

- **Make the intergovernmental part of the process more accessible.** Plenaries where SPMs are approved are restricted to IPCC officials, authors, government representatives, and nongovernmental observer organizations. Opening the process to accredited media would strengthen understanding and acceptance with the broader public. Enhanced transparency might have reduced the odds of episodes such as that occurring at the recent WGIII plenary.

- **Experiment with more formal approaches to assessment.** Many interesting approaches to assessing the literature, including formalized expert elicitation, are available which could complement IPCC's current approach. Large scale expert assessment is a recent phenomenon. We need to be scientific about finding the best approaches to assessment because the problems are complex, the risks are high, and the effects of evidence-based decisions to act (or not act) are sometimes irreversible.

Conclusion

IPCC has performed an important service to governments and the general public by assessing the scientific literature, determining the consensus and range of expert views on critical questions, collaborating with governments to state those findings clearly and succinctly in the Summaries for Policymakers, and aiming to widely disseminate its reports. By and large, IPCC has been a highly successful experiment in science-policy interaction. But the interface of science with the intergovernmental process presents pitfalls, including contentiousness over the final products of the process. The best solution to this difficulty is to further increase transparency, both procedural and substantive. Furthermore, IPCC needs to lighten the burden it creates for the scientific community and its author-experts in particular. At the same time, it can sharpen its products and target them at issues of immediate interest. Finally, IPCC's procedures for carrying out the assessment process need a thorough study and review in order to assure that they are as effective as possible. The world needs an IPCC and IPCC needs to continually improve its performance to meet that need. Our ability to appropriately deal with the risk of climate change depends on it.

Once again, I thank the Chairman and the committee for availing me this opportunity to testify.

Endnotes

1. Collaborative Research: Assessing Assessments: A Historical and Philosophical Study of Scientific Assessments for Environmental Policy in the Late 20th Century. NSF Award Number 0958378
2. The Limits of Consensus (M Oppenheimer et al), S*cience* **317**, 1505-6, 2007.
3. See www.ipcc.ch for details
4. Courtesy of IPCC WGII Technical Support Unit
5. Climate change prediction: erring on the side of least drama? (Brysse et al), *Global Environmental Change*, http://dx.doi.org/10.1016/j.gloenvcha.2012.10.008
6. Details available at https://www.ipcc-wg1.unibe.ch/**;** http://ipcc-wg2.gov/AR5; http://www.ipcc-wg3.de/
7. *Climate Change Assessments: review of the process and procedures of the IPCC*. Report of the InterAcademy Council, August 2010.