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## Climate science: well done, could do better

Scientists working on climate change have come under intense scrutiny over the past year. They – as well as scientific institutions and climate science itself – have been accused of procedural and methodological flaws, and even of outright fraud. The criticism prompted the commissioning of several independent reviews, most of which reported their findings in summer 2010. Following this examination, the scientific consensus that human activity has induced climate change remains intact.

Of particular significance was a review of the Intergovernmental Panel for Climate Change (IPCC) by the InterAcademy Council (IAC), a multinational organisation of science academies. UN Secretary-General Ban Ki-moon and Rajendra Pachauri, IPCC chair, asked the IAC to consider the panel's processes and recommend changes. Its conclusions, released in a 100-page report in August, were interpreted by climate-change sceptics as an indictment of the IPCC. However, they could more accurately be summed up as: 'Well done, could do better'.

### Errors and accusations

In November 2009, a month before the start of the UN Climate Change Conference in Copenhagen, a discussion paper from India's Ministry of Environment and Forests challenged an IPCC statement on the melting of Himalayan glaciers. The IPCC's Fourth Assessment Report in 2007 had asserted that the 'likelihood of [the glaciers] disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate'. Publication of the Indian paper led to detailed scrutiny of the claim, which revealed that it was based on a 1999 news article which was itself based on speculation rather than original research. The article had been cited in a 2005 World Wildlife Fund report, which was in turn cited in the IPCC volume.

A week later, [leaked e-mails between academics](#) at the University of East Anglia (UEA) in eastern England were interpreted by climate-change sceptics to show that scientists had deliberately manipulated or invented data, and had conspired to prevent the publication of research contradicting their own. Both the e-mails and the erroneous statement on glaciers were claimed by sceptics on blogs and in the media to be smoking guns that fatally undermined the credibility of the entire three-volume, 3,000-page IPCC report.

In January the IPCC acknowledged the glacier error, noting however that its withdrawal of the claim did not affect its broader conclusions on loss of glaciers and other impacts on water resources. Independent inquiries into the e-mails later concluded that there was no evidence of scientific malpractice, though scientists were criticised for a lack of openness.

In February 2010 another alleged error in the IPCC report was reported: an assertion that by 2020 yields from rain-fed agriculture in some African countries could decline by up to 50%. The IPCC citation was not to a peer-reviewed scientific publication but to a think-tank report. However, the cited source was a summary and analysis of valid scientific and technical reports and submissions. The problem was not that evidence for the claim was lacking, but that in the course of abstraction and simplification from the original research to the think-tank report to the IPCC report to a shorter Synthesis Report, important caveats and nuances were lost, particularly with regard to degrees of uncertainty in the conclusions.

Other alleged errors in the IPCC report that have received press coverage during 2010 include a statement that 55% of the territory of the Netherlands is below sea level, that even a slight drop in precipitation could drastically affect 40% of the Amazonian forest, and that the economic impact of extreme weather events had risen rapidly since the 1970s. More generally, the IPCC was accused of excessive reliance on 'grey', or non-peer-reviewed, literature. The error with regard to the Netherlands was made (and subsequently corrected) by the IPCC's source, the Netherlands Environmental Assessment Agency (NEAA), and had no bearing on the IPCC's conclusions. The accuracy of the other alleged mis-statements has been strongly defended by the IPCC and the scientists on whose work the claims were based.

Finally, there were allegations, vigorously denied by Pachauri, that the IPCC chairman had a conflict of interest because of his role as an adviser and consultant to businesses with vested interests in the outcome of the UN Framework Convention on Climate Change negotiations. In particular, his employment as head of the Energy Research Institute, set up and part-funded by one of India's largest business groups, came under fire. In August an [independent audit](#) by KPMG concluded that the charges against him were baseless.

### **Settled science**

None of the recent criticisms is relevant to the scientific reasons that the IPCC adduced for recognising the reality of anthropogenic climate change. The e-mails controversy related only to whether the warming of the last few decades was historically unprecedented – a question that had no bearing on whether the rise in temperature has been caused by human activity and is likely to continue. The IPCC's retraction of the Himalayan glacier claim was not a crack in the scientific consensus, as critics argued; in fact, the real error was the inclusion in the body of the report of a claim that was at odds with the consensus, as reflected in material on glaciers in the first volume of the IPCC report on the physical scientific basis of climate change. It was a failure not of science, but of procedure: explicit IPCC guidelines for what should be included were violated, and the IPCC corrected the error when it was discovered. The other real and alleged errors were cases of poor editing and editorial procedure, or errors in the source material. A [July 2010 report](#) from the NEAA assessing statements on projected regional impacts in the IPCC report – where almost all of the alleged errors lay – concluded that the errors were minor and did not undermine the panel's conclusions.

This means that the scientific consensus on climate change remains undamaged, and the conclusions of the IPCC detailed in the Fourth Assessment Report's Summaries for Policymakers and Synthesis Report remain valid.

In fact, the close scrutiny faced by the 2007 report over the last year has strengthened rather than weakened scientists' confidence in its conclusions. The mistakes uncovered were remarkably few and relatively insignificant for a report of such magnitude. The Himalayan glacier claim, for example, although widely reported at the time of correction as 'one of the central predictions of the IPCC', was not included in the Summary for Policymakers or the Synthesis Report, and two years had passed before it was noticed and brought to public attention, despite being clearly anomalous and unsupported. Although some errors were alleged by sceptics of anthropogenic climate change, the majority of the real mistakes, such as the glacier claim, were first identified by scientists who had been involved in the preparation of the report.

However, while scientific confidence may have been strengthened, public confidence has not. The allegations were widely covered and constantly repeated in the media. The *New York Times* story on the retraction of the Himalayan glacier claim was longer than its original story on the release of the 1,000-page report itself. London's *Sunday Times* was forced to withdraw an article alleging the Amazonian rainforest error, five months after it was published, and the *Daily Telegraph* withdrew an article alleging a conflict of interest on the part of the IPCC chairman. Several opinion polls in February 2010 reported a significant drop in the percentage of the public in both the United States and the United Kingdom that believed that climate change was real, a serious threat and due to human activity, although this shift may also have been due in part to unusually cold winter weather.

### **Making improvements**

The UN-commissioned report of the [IAC](#) concluded that the IPCC assessment process had been successful overall and served society well, but that fundamental changes to the process and management structure were essential. In the case of the Himalayan glacier claim, in particular, the report concluded that the review process failed in two ways: the authors did not give sufficient consideration to thoughtful review comments which would have improved the quality of the report, while the review editors did not ensure that the comments were adequately addressed and that controversies were reflected adequately in the text of the report. The lead authors also failed to evaluate sufficiently their non-peer-reviewed sources. The IAC recommended that the IPCC should strengthen the review process, improve the characterisation and communication of uncertainties, modernise its management structure, develop an effective communications strategy and increase transparency. ([Read a summary of the recommendations](#)).

Of 22 detailed recommendations, the most immediately salient were to limit the term of the proposed new IPCC executive director, the IPCC chair and the Working Group co-chairs to a single assessment cycle (which lasts for five to six years). This would mean that Pachauri, who took up his post in April 2002 at the beginning of the fourth assessment cycle, would have to step down. The IAC said the IPCC should adopt a more targeted and effective process for responding to review comments, and should clarify the use of unpublished and non-peer-reviewed sources. The IPCC's Working Groups should use the same qualitative scale for the robustness of scientific understanding of particular points, indicate the basis for assigning a probability to an outcome or event, and provide a traceable account of how they arrived at particular ratings or likelihoods.

The IAC also addressed the important question of how the IPCC should gain public

acceptance of its findings. It recommended a communications strategy with emphasis on transparency, rapid response and relevance to stakeholders. The IAC recommendations covered ways the IPCC could better communicate its findings – including more user-friendly publications – and respond to criticisms. It also, however, called for strict guidelines covering who was authorised to speak on behalf of the organisation, and training to ensure that they kept within the organisation's remit of providing policy-relevant information about climate issues without advocating particular policies.

The IAC report was intended to inform discussion at an IPCC Plenary meeting to be held in Busan, South Korea, on 11–14 October. Pachauri has been under pressure to resign, not just from critics but also from some environmentalists and climate scientists who feel that the controversy surrounding him, even if unfounded, detracts from the message about climate change and risks undermining the fifth assessment process. It is likely that the IPCC will adopt the bulk of the IAC recommendations in Busan, but the developed countries may be unwilling to force the chair to step down, to avoid alienating developing countries.

The IAC identified three further issues that affect the nature and quality of the IPCC assessment reports: the participation of developing countries, non-governmental organisations and private companies in the process; public access to information (an issue highlighted by the UEA e-mail controversy); and the structure of the IPCC Working Groups and the timing of their reports, which are currently released within months of each other but could be staggered over several years. The IAC came to no conclusions and offered no recommendations, but highlighted these issues for future consideration.

It would be remarkable for any process or publication of the scope of the IPCC's Fourth Assessment Report to be entirely error free. But after a year of unusually strict scrutiny by the public, press and politicians, the report's conclusions remain robust and the scientific consensus on climate change remains intact. Many of the recommendations of the IAC, including those related to strengthening, modifying or enforcing IPCC procedures, could be adopted in Busan. The management, communications and conflict-of-interest recommendations may take longer, but could still be implemented before the completion of the Fifth Assessment Report, due in 2013. This would improve the report's quality and make it better oriented to the needs of policymakers and the public.

