Being an expert in the age of uncertainty: Climate scientists should not be afraid of expressing assessments of both best and worse case climate change risks

Arthur Petersen *argues that climate scientists need to better convey uncertainties so that policy-makers and the public can more readily grasp the full range of potential impacts of climate change.*

The scientists who have been charged with writing the next assessment report of the Intergovernmental Panel on Climate Change (IPCC) should not be afraid of expressing their expert judgement in assessments of potential future impacts of climate change. As this latest assessment round of the IPCC is heading into its final year of drafting, the authors should be reminded that they will best serve their readers by assessing both best-case and worst-case risks.

Although recent controversies about the IPCC have highlighted that its last assessment in 2007 overstated the rate of melting of the Himalayan glaciers and overemphasised in its summary the most negative projected regional impacts of global warming, it is less well appreciated that the report also provided estimates of some of the most important future risks that many scientists think were too conservative.

For example, the IPCC's estimates in 2007 of possible rises in global sea level by the end of the century neglected the possibility of a rapid destabilisation of the land-based ice sheets in West Antarctica and Greenland, which could cause a much bigger increase.

The report openly acknowledged that this impact was excluded because current models of ice sheets cannot produce reliable projections. Yet it would have been far more helpful to policy-makers if the scientists had used their expert judgement to estimate how much more sea levels might rise than the 59 centimetres presented in the worst case scenario in the report.

Similarly, the climate models cited by the IPCC in estimates of temperature change by the end of the century did not fully take into account uncertainties in the relationship between the climate and the Earth's carbon cycle. And even though this shortcoming was openly acknowledged in the 2007 assessment, the researchers who prepared the report's summary for policy-makers did not attempt to quantify how it might affect future projections of temperature.

As a result, policy-makers and the public are not being fully informed of the worst potential consequences of climate change, because the scientists involved in producing IPCC assessments have been reluctant to over-rule conservative estimates by computer models.

As I point out in my book 'Simulating Nature: A Philosophical Study of Computer-Simulation Uncertainties and Their Role in Climate Science and Policy Advice', this major problem has arisen partly because the researchers who wrote the 2007 IPCC report were not given adequate guidance about how they should convey uncertainties, for instance in estimates of future impacts.

To ensure that this mistake is not repeated, the authors of the next assessment report, the first volume of which will be published next year, need to give clearer explanations of the different sources of uncertainty, as well as estimates of their importance.

This means that they need to distinguish between uncertainty that can be quantified by a range, either with statistics or based on 'what if' assumptions, and uncertainty that cannot be quantified, due to methodological unreliability, recognised ignorance, or value diversity in the practice of climate science (see my book).

Both qualitative and quantitative dimensions of uncertainty should be addressed simultaneously when assessing scientific knowledge about climate processes and their consequences.

The IPCC recognised this need and produced a new guidance note for authors of the next assessment about how to treat uncertainties consistently. But while this may help researchers to communicate with each other, it is not clear that it will help them to convey uncertainties more clearly to policy-makers.

Researchers used the new guidance on uncertainties to prepare the Summary for Policy-Makers of the IPCC 'Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation'.

They used the guidance note's different scales to describe the quality of evidence, the degree of agreement between different sets of evidence, and the overall confidence in the summarising statements. While this may have satisfied the authors (and my own) desire to create a detailed taxonomy of uncertainty, I fear that the resulting summary is a technical document that makes only qualitative statements about potential future impacts.

For instance, in relation to sea level rise, the summary states:

> *"It is very likely that mean sea level rise will contribute to upward trends in extreme coastal high water levels in the future. There is high confidence that locations currently experiencing adverse impacts such as coastal erosion and inundation will continue to do so in the future due to increasing sea levels, all other contributing factors being equal. The very likely contribution of mean sea level rise to increased extreme coastal high water levels, coupled with the likely increase in tropical cyclone maximum wind speed, is a specific issue for tropical small island states."*

Governments (including the UK's and my own government, of the Netherlands) share responsibility for the quality of the language used in the summary as they approved each line in a session of the IPCC behind closed doors last November.

Over the next two years, in the government review rounds of the IPCC assessment reports, they have an opportunity to offer additional guidance to researchers about how to convey uncertainties in a way that allows policy-makers and the public to more readily grasp the full range of potential impacts of climate change.

Note: This article gives the views of the author, and not the position of the British Politics and Policy blog, nor of the London School of Economics. Please read our comments policy before posting.

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